

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
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 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender pro WEA**Berechnung: Zusatzbelastung WEA: 4 - WEA 4****Voraussetzungen für Berechnung des Schattenwurfs**

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 16:02	08:06 15:13-16:23/70 16:53	07:08 15:25-15:56/31 17:50	06:53 19:49	05:43 20:45	04:52 21:36
2	08:35 16:03	08:04 15:13-16:25/72 16:55	07:06 15:28-15:54/26 17:52	06:50 19:51	05:41 20:47	04:51 21:37
3	08:35 16:05	08:02 15:13-16:28/75 16:57	07:04 15:31-15:50/19 17:54	06:48 19:53	05:39 20:48	04:50 21:38
4	08:35 16:06	08:01 15:13-16:30/77 16:59	07:01 17:56	06:45 19:54	05:37 20:50	04:49 21:39
5	08:35 16:07	07:59 15:12-16:31/79 17:01	06:59 17:29-17:32/3 17:58	06:43 19:56	05:35 20:52	04:48 21:41
6	08:34 16:08	07:57 15:12-16:31/79 17:03	06:57 17:27-17:34/7 17:59	06:41 19:58	05:32 20:54	04:47 21:42
7	08:34 16:10	07:55 15:12-16:30/78 17:05	06:54 17:24-17:36/12 18:01	06:38 20:00	05:31 20:56	04:47 21:43
8	08:33 16:11	07:53 15:12-16:30/78 17:07	06:52 17:24-17:38/14 18:03	06:36 20:02	05:29 20:58	04:46 21:44
9	08:33 16:12	07:51 15:12-16:28/76 17:09	06:49 17:22-17:40/18 18:05	06:33 20:04	05:27 20:59	04:45 21:45
10	08:32 16:14	07:49 15:11-16:28/77 17:12	06:47 17:22-17:42/20 18:07	06:31 20:06	05:25 21:01	04:45 21:46
11	08:32 16:15	07:48 15:11-16:26/75 17:14	06:45 17:22-17:43/21 18:09	06:28 20:08	05:23 21:03	04:44 21:46
12	08:31 16:17	07:46 15:11-16:24/73 17:16	06:42 17:21-17:42/21 18:11	06:26 20:09	05:21 21:05	04:44 21:47
13	08:30 16:18	07:43 15:11-16:15/64 17:18	06:40 17:22-17:42/20 18:13	06:24 20:11	05:19 21:06	04:44 21:48
14	08:29 16:20	07:41 15:11-16:14/63 17:20	06:37 17:22-17:41/19 18:15	06:21 20:13	05:17 21:08	04:43 21:49
15	08:28 16:22	07:39 15:12-16:11/59 17:22	06:35 17:23-17:40/17 18:17	06:19 20:15	05:16 21:10	04:43 21:49
16	08:27 16:23	07:37 15:11-16:10/59 17:24	06:32 17:23-17:38/15 18:19	06:17 20:17	05:14 21:12	04:43 21:50
17	08:26 15:32-15:39/7 16:25	07:35 15:12-16:10/58 17:26	06:30 17:26-17:36/10 18:21	06:14 20:19	05:12 21:13	04:43 21:50
18	08:25 15:28-15:44/16 16:27	07:33 15:12-16:09/57 17:28	06:27 18:23	06:12 20:21	05:11 21:15	04:43 21:51
19	08:24 15:25-15:46/21 16:29	07:31 15:13-16:09/56 17:30	06:25 18:24	06:09 20:22	05:09 21:17	04:42 21:51
20	08:23 15:24-15:49/25 16:30	07:29 15:13-16:08/55 17:32	06:22 18:26	06:07 20:24	05:07 21:18	04:43 21:52
21	08:22 15:23-15:52/29 16:32	07:27 15:14-16:08/54 17:34	06:20 18:28	06:05 20:26	05:06 21:20	04:43 21:52
22	08:21 15:21-15:53/32 16:34	07:24 15:15-16:07/52 17:36	06:18 18:30	06:03 20:28	05:04 21:21	04:43 21:52
23	08:19 15:20-15:55/35 16:36	07:22 15:15-16:05/50 17:38	06:15 18:32	06:00 20:30	05:03 21:23	04:43 21:53
24	08:18 16:00-16:06/6 16:38 15:19-15:56/37	07:20 15:17-16:05/48 17:40	06:13 18:34	05:58 20:32	05:02 21:25	04:43 21:53
25	08:17 15:19-16:09/50 16:40	07:18 15:18-16:04/46 17:42	06:10 18:36	05:56 20:34	05:00 21:26	04:43 21:53
26	08:15 15:17-16:10/53 16:42	07:15 15:19-16:02/43 17:44	06:08 18:38	05:54 20:36	04:59 21:28	04:44 21:53
27	08:14 15:16-16:12/56 16:44	07:13 15:21-16:01/40 17:46	06:05 18:39	05:51 20:37	04:58 21:29	04:44 21:53
28	08:12 15:16-16:15/59 16:45	07:11 15:22-15:58/36 17:48	06:03 18:41	05:49 20:39	04:56 21:30	04:45 21:53
29	08:11 15:15-16:17/62 16:47		06:00 18:43	05:47 20:41	04:55 21:32	04:45 21:52
30	08:09 15:15-16:19/64 16:49		05:58 18:45	05:45 20:43	04:54 21:33	04:46 21:52
31	08:08 15:14-16:21/67 16:51		06:55 19:47		04:53 21:35	
Sonnenscheinstunden	248	271	365	419	494	511
Anzahl Minuten mit Schatten	619	1749	273	0	0	0

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
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Berechnet:
20.08.2019 10:57/3.2.744**SHADOW - Kalender pro WEA****Berechnung: Zusatzbelastung WEA: 4 - WEA 4****Voraussetzungen für Berechnung des Schattenwurfs**

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober	November	Dezember
1	04:47 21:52	05:26 21:17	06:21 20:11	07:15 18:01-18:21/20 18:56	07:13 14:40-15:55/75 16:45	08:09 15:59
2	04:47 21:52	05:28 21:15	06:23 20:08	07:16 18:01-18:21/20 18:54	07:15 14:40-15:57/77 16:43	08:11 15:58
3	04:48 21:51	05:29 21:14	06:24 20:06	07:18 18:00-18:21/21 18:51	07:17 14:40-15:58/78 16:41	08:12 15:57
4	04:49 21:51	05:31 21:12	06:26 20:03	07:20 18:00-18:21/21 18:49	07:19 14:40-15:59/79 16:39	08:14 15:57
5	04:50 21:50	05:33 21:10	06:28 20:01	07:22 17:59-18:19/20 18:46	07:21 14:42-16:00/78 16:37	08:15 15:56
6	04:51 21:50	05:35 21:08	06:30 19:58	07:24 17:59-18:17/18 18:44	07:23 14:42-16:00/78 16:35	08:17 15:56
7	04:51 21:49	05:36 21:06	06:32 19:56	07:26 18:00-18:14/14 18:42	07:25 14:42-16:00/78 16:33	08:18 15:55
8	04:52 21:48	05:38 21:04	06:33 19:54	07:27 18:00-18:12/12 18:39	07:27 14:42-16:00/78 16:31	08:19 15:55
9	04:53 21:48	05:40 21:02	06:35 19:51	07:29 18:02-18:09/7 18:37	07:29 14:43-15:59/76 16:29	08:21 15:54
10	04:55 21:47	05:42 21:00	06:37 19:49	07:31 18:04-18:07/3 18:34	07:31 14:43-15:57/74 16:28	08:22 15:54
11	04:56 21:46	05:43 20:58	06:39 19:46	07:33 18:32	07:33 14:45-15:56/71 16:26	08:23 15:53
12	04:57 21:45	05:45 20:56	06:41 19:44	07:35 16:05-16:23/18 18:30	07:35 14:45-15:54/69 16:24	08:24 15:53
13	04:58 21:44	05:47 20:54	06:42 19:41	07:37 16:01-16:27/26 18:27	07:37 14:46-15:52/66 16:22	08:25 15:53
14	04:59 21:43	05:49 20:52	06:44 19:39	07:39 15:58-16:29/31 18:25	07:39 14:47-15:50/63 16:21	08:26 15:53
15	05:00 21:42	05:50 20:50	06:46 19:36	07:41 15:55-16:31/36 18:22	07:41 14:48-15:48/60 16:19	08:27 15:53
16	05:02 21:41	05:52 20:47	06:48 19:34	07:42 15:53-16:33/40 18:20	07:43 14:49-15:46/57 16:18	08:28 15:53
17	05:03 21:40	05:54 20:45	06:49 19:31	07:44 15:51-16:34/43 18:18	07:44 14:50-15:44/54 16:16	08:29 15:53
18	05:04 21:39	05:56 20:43	06:51 19:29	07:46 15:50-16:35/45 18:15	07:46 14:51-15:42/51 16:14	08:30 15:53
19	05:06 21:37	05:58 20:41	06:53 19:26	07:48 15:48-16:36/48 18:13	07:48 15:32-15:41/9 16:13	08:31 15:53
20	05:07 21:36	05:59 20:39	06:55 19:24	07:50 15:47-16:37/50 18:11	07:50 14:55-15:31/36 16:12	08:32 15:54
21	05:09 21:35	06:01 20:36	06:57 19:21	07:52 15:46-16:37/51 18:09	07:52 14:56-15:30/34 16:10	08:32 15:54
22	05:10 21:33	06:03 20:34	06:58 19:19	07:54 15:45-16:38/53 18:06	07:54 14:58-15:28/30 16:09	08:33 15:54
23	05:12 21:32	06:05 20:32	07:00 19:16	07:56 15:44-16:38/54 18:04	07:56 15:00-15:27/27 16:08	08:33 15:55
24	05:13 21:30	06:07 20:29	07:02 19:14	07:58 15:43-16:39/56 18:02	07:57 15:02-15:25/23 16:06	08:34 15:55
25	05:15 21:29	06:08 20:27	07:04 19:11	08:00 15:42-16:39/57 18:00	07:59 15:04-15:23/19 16:05	08:34 15:56
26	05:16 21:27	06:10 20:25	07:06 19:09	08:02 15:41-16:39/58 17:57	08:01 15:07-15:20/13 16:04	08:35 15:57
27	05:18 21:26	06:12 20:22	07:07 18:12-18:13/1 19:06	07:04 14:41-15:39/58 16:55	08:03 16:03	08:35 15:57
28	05:20 21:24	06:14 20:20	07:09 18:06-18:17/11 19:04	07:06 14:41-15:40/59 16:53	08:04 16:02	08:35 15:58
29	05:21 21:22	06:16 20:18	07:11 18:04-18:19/15 19:01	07:07 14:41-15:43/62 16:51	08:06 16:01	08:35 15:59
30	05:23 21:21	06:17 20:15	07:13 18:02-18:20/18 18:59	07:09 14:41-15:45/64 16:49	08:08 16:00	08:35 16:00
31	05:24 21:19	06:19 20:13		07:11 15:47-15:53/6 16:47		08:35 16:01
Sonnenscheinstunden	515	462	384	330	259	232
Anzahl Minuten mit Schatten	0	0	45	1136	1492	0

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten
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im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

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 20.08.2019 10:57/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 5 - WEA 5

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

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Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 15:04-15:27/23	08:06 16:53	07:08 17:50	06:53 19:49	05:43 19:51-20:10/19	04:52 05:25-05:49/24
	16:02	16:53	17:50	19:49	20:45	21:36
2	08:35 15:03-15:28/25	08:04 17:06	07:06 17:51	06:50 19:51	05:41 19:51-20:10/19	04:51 05:24-05:49/25
	16:03	16:55	17:52	19:51	20:47	21:37
3	08:35 15:04-15:29/25	08:02 17:04	07:04 17:53	06:48 19:53	05:39 19:53-20:10/17	04:50 05:23-05:50/27
	16:05	16:57	17:54	19:53	20:48	21:38
4	08:35 15:04-15:30/26	08:01 17:01	07:01 17:56	06:45 19:54	05:37 19:54-20:08/14	04:49 05:23-05:51/28
	16:06	16:59	17:56	19:54	20:50	21:39
5	08:35 15:04-15:32/28	07:59 17:01	06:59 17:58	06:43 19:56	05:35 19:55-20:07/12	04:48 05:22-05:52/30
	16:07	17:01	17:58	19:56	20:52	21:41
6	08:34 15:04-15:33/29	07:57 17:03	06:57 17:59	06:41 19:58	05:33 19:57-20:04/7	04:48 21:06-21:08/2
	16:08	17:03	17:59	19:58	20:54	21:42 05:21-05:52/31
7	08:34 15:05-15:34/29	07:55 17:05	06:54 18:01	06:38 20:00	05:31 20:56	04:47 21:06-21:10/4
	16:10	17:05	18:01	20:00	20:56	21:43 05:21-05:53/32
8	08:33 15:05-15:35/30	07:53 17:07	06:52 18:03	06:36 20:02	05:29 20:58	04:46 21:05-21:10/5
	16:11	17:07	18:03	20:02	20:58	21:44 05:20-05:53/33
9	08:33 15:05-15:35/30	07:51 17:10	06:49 18:05	06:33 20:04	05:27 20:59	04:46 21:05-21:11/6
	16:12	17:10	18:05	20:04	20:59	21:45 05:20-05:54/34
10	08:32 15:05-15:35/30	07:49 17:12	06:47 18:07	06:31 20:06	05:25 21:01	04:45 21:04-21:12/8
	16:14	17:12	18:07	20:06	21:01	21:46 05:19-05:54/35
11	08:32 15:07-15:37/30	07:48 17:14	06:45 18:09	06:28 20:08	05:23 21:03	04:44 21:04-21:13/9
	16:15	17:14	18:09	20:08	21:03	21:46 05:19-05:55/36
12	08:31 15:07-15:37/30	07:46 17:16	06:42 18:11	06:26 20:09	05:21 21:05	04:44 21:04-21:14/10
	16:17	17:16	18:11	20:09	21:05	21:47 05:19-05:56/37
13	08:30 15:07-15:37/30	07:44 17:18	06:40 18:13	06:24 20:11	05:19 21:06	04:44 21:04-21:14/10
	16:19	17:18	18:13	20:11	21:06	21:48 05:18-05:55/37
14	08:29 15:08-15:38/30	07:41 17:20	06:37 18:15	06:21 20:13	05:17 21:08	04:43 21:04-21:15/11
	16:20	17:20	18:15	20:13	21:08	21:49 05:18-05:56/38
15	08:28 15:07-15:37/30	07:39 17:22	06:35 18:17	06:19 20:15	05:16 21:10	04:43 21:04-21:15/11
	16:22	17:22	18:17	20:15	21:10	21:49 05:18-05:56/38
16	08:27 15:08-15:38/30	07:37 17:24	06:32 18:19	06:17 20:17	05:14 21:12	04:43 21:04-21:16/12
	16:23	17:24	18:19	20:17	21:12	21:50 05:18-05:57/39
17	08:26 15:08-15:38/30	07:35 17:26	06:30 18:21	06:14 20:19	05:12 21:13	04:43 21:04-21:17/13
	16:25	17:26	18:21	20:19	21:13	21:50 05:18-05:57/39
18	08:25 15:09-15:39/30	07:33 17:28	06:27 18:23	06:12 20:21	05:11 21:15	04:43 21:04-21:17/13
	16:27	17:28	18:23	20:21	21:15	21:51 05:18-05:57/39
19	08:24 15:09-15:38/29	07:31 17:30	06:25 18:24	06:10 20:22	05:09 21:17	04:43 21:04-21:17/13
	16:29	17:30	18:24	20:22	21:17	21:51 05:18-05:58/40
20	08:23 15:10-15:38/28	07:29 17:32	06:23 18:26	06:07 20:24	05:07 21:18	04:43 21:05-21:18/13
	16:30	17:32	18:26	20:24	21:18	21:52 05:18-05:58/40
21	08:22 15:11-15:39/28	07:27 17:34	06:20 18:28	06:05 19:58-19:59/1	05:06 21:20	04:43 21:05-21:18/13
	16:32	17:34	18:28	20:26	21:20	21:52 05:18-05:58/40
22	08:21 15:11-15:38/27	07:24 17:36	06:18 18:30	06:03 19:56-20:01/5	05:04 21:21	04:43 21:05-21:18/13
	16:34	17:36	18:30	20:28	21:21	21:52 05:18-05:58/40
23	08:19 15:13-15:38/25	07:22 17:38	06:15 18:32	06:00 19:55-20:03/8	05:03 21:23	04:43 21:06-21:19/13
	16:36	17:38	18:32	20:30	21:23	21:53 05:19-05:59/40
24	08:18 15:13-15:38/25	07:20 17:40	06:13 18:34	05:58 19:53-20:05/12	05:02 21:25	04:43 21:06-21:19/13
	16:38	17:40	18:34	20:32	21:25	21:53 05:19-05:59/40
25	08:17 15:15-15:38/23	07:18 17:42	06:10 18:36	05:56 19:53-20:07/14	05:00 21:26	04:44 21:05-21:18/13
	16:40	17:42	18:36	20:34	21:26	21:53 05:19-05:59/40
26	08:15 15:16-15:36/20	07:15 17:44	06:08 18:38	05:54 19:52-20:08/16	04:59 05:31-05:40/9	04:44 21:06-21:19/13
	16:42	17:44	18:38	20:36	21:28	21:53 05:20-05:59/39
27	08:14 15:17-15:35/18	07:13 17:46	06:05 18:39	05:51 19:52-20:10/18	04:58 05:30-05:42/12	04:44 21:06-21:18/12
	16:44	17:46	18:39	20:37	21:29	21:53 05:20-05:59/39
28	08:12 15:20-15:34/14	07:11 17:48	06:03 18:41	05:49 19:51-20:11/20	04:56 05:29-05:44/15	04:45 21:06-21:18/12
	16:45	17:48	18:41	20:39	21:30	21:53 05:21-06:00/39
29	08:11 15:22-15:32/10		06:00 18:43	05:47 19:51-20:11/20	04:55 05:28-05:46/18	04:45 21:07-21:18/11
	16:47		18:43	20:41	21:32	21:52 05:21-05:59/38
30	08:09		05:58 18:45	05:45 19:51-20:11/20	04:54 05:27-05:47/20	04:46 21:08-21:19/11
	16:49		18:45	20:43	21:33	21:52 05:22-06:00/38
31	08:08		06:55 19:47		04:53 05:26-05:48/22	
	16:51		19:47		21:35	
Sonnenscheinstunden	248	271	365	419	494	511
Anzahl Minuten mit Schatten	762	0	0	134	184	1339

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten

Projekt:
19-095-GBK-02

Beschreibung:
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:
T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 5 - WEA 5

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Jul	August	September	Oktober	November	Dezember
1	04:47 21:08-21:18/10 21:52 05:22-05:59/37	05:26 21:17	06:21 20:11	07:15 18:56	07:13 16:45	08:09 14:49-15:19/30 15:59
2	04:47 21:08-21:18/10 21:52 05:23-06:00/37	05:28 21:15	06:23 20:08	07:16 18:54	07:15 16:43	08:11 14:48-15:18/30 15:58
3	04:48 21:09-21:18/9 21:51 05:24-06:00/36	05:30 21:14	06:24 20:06	07:18 18:51	07:17 16:41	08:12 14:49-15:19/30 15:58
4	04:49 21:09-21:16/7 21:51 05:25-06:00/35	05:31 21:12	06:26 20:03	07:20 18:49	07:19 16:39	08:14 14:50-15:20/30 15:57
5	04:50 21:10-21:16/6 21:50 05:25-05:59/34	05:33 21:10	06:28 20:01	07:22 18:47	07:21 16:37	08:15 14:50-15:19/29 15:56
6	04:51 21:11-21:16/5 21:50 05:26-05:59/33	05:35 21:08	06:30 19:58	07:24 18:44	07:23 16:35	08:17 14:51-15:20/29 15:56
7	04:52 21:12-21:16/4 21:49 05:27-05:59/32	05:36 21:06	06:32 19:56	07:26 18:42	07:25 16:33	08:18 14:51-15:20/29 15:55
8	04:53 21:13-21:15/2 21:48 05:28-05:59/31	05:38 20:07-20:13/6 21:04	06:33 19:54	07:28 18:39	07:27 16:31	08:19 14:52-15:20/28 15:55
9	04:54 05:29-05:59/30 21:48	05:40 20:05-20:16/11 21:02	06:35 19:51	07:29 18:37	07:29 16:29	08:21 14:52-15:19/27 15:54
10	04:55 05:30-05:58/28 21:47	05:42 20:02-20:16/14 21:00	06:37 19:49	07:31 18:34	07:31 16:28	08:22 14:52-15:18/26 15:54
11	04:56 05:31-05:58/27 21:46	05:43 20:01-20:18/17 20:58	06:39 19:46	07:33 18:32	07:33 16:26	08:23 14:54-15:19/25 15:53
12	04:57 05:32-05:57/25 21:45	05:45 20:01-20:19/18 20:56	06:41 19:44	07:35 18:30	07:35 16:24	08:24 14:54-15:18/24 15:53
13	04:58 05:33-05:57/24 21:44	05:47 19:59-20:19/20 20:54	06:42 19:41	07:37 18:27	07:37 16:22	08:25 14:55-15:18/23 15:53
14	04:59 05:34-05:56/22 21:43	05:49 19:59-20:19/20 20:52	06:44 19:39	07:39 18:25	07:39 16:21	08:26 14:55-15:17/22 15:53
15	05:01 05:35-05:55/20 21:42	05:51 19:59-20:20/21 20:50	06:46 19:36	07:41 18:22	07:41 16:19	08:27 14:56-15:17/21 15:53
16	05:02 05:37-05:55/18 21:41	05:52 19:58-20:19/21 20:47	06:48 19:34	07:42 18:20	07:43 16:18	08:28 14:56-15:17/21 15:53
17	05:03 05:38-05:53/15 21:40	05:54 19:58-20:17/19 20:45	06:49 19:31	07:44 18:18	07:44 16:16	08:29 14:57-15:17/20 15:53
18	05:05 05:39-05:51/12 21:39	05:56 19:59-20:15/16 20:43	06:51 19:29	07:46 18:15	07:46 16:15	08:30 14:58-15:18/20 15:53
19	05:06 05:40-05:49/9 21:37	05:58 19:58-20:13/15 20:41	06:53 19:26	07:48 18:13	07:48 16:13	08:31 14:58-15:17/19 15:53
20	05:07 21:36	05:59 19:59-20:11/12 20:39	06:55 19:24	07:50 18:11	07:50 16:12	08:32 14:58-15:18/20 15:54
21	05:09 21:35	06:01 20:00-20:09/9 20:36	06:57 19:21	07:52 18:09	07:52 16:10	08:32 14:59-15:18/19 15:54
22	05:10 21:33	06:03 20:00-20:06/6 20:34	06:58 19:19	07:54 18:06	07:54 16:09	08:33 14:59-15:18/19 15:55
23	05:12 21:32	06:05 20:02-20:04/2 20:32	07:00 19:16	07:56 18:04	07:56 16:08	08:33 15:00-15:19/19 15:55
24	05:13 21:30	06:07 20:29	07:02 19:14	07:58 18:02	07:57 16:06	08:34 15:00-15:19/19 15:56
25	05:15 21:29	06:08 20:27	07:04 19:11	08:00 18:00	07:59 16:05	08:34 15:00-15:20/20 15:56
26	05:16 21:27	06:10 20:25	07:06 19:09	08:02 17:58	08:01 16:04	08:35 15:02-15:21/19 15:57
27	05:18 21:26	06:12 20:22	07:07 19:06	08:03 16:55	08:03 16:03	08:35 15:02-15:22/20 15:58
28	05:20 21:24	06:14 20:20	07:09 19:04	08:04 16:53	08:04 16:02	08:35 15:02-15:22/20 15:58
29	05:21 21:22	06:16 20:18	07:11 19:01	08:06 16:51	08:06 16:01	08:35 15:02-15:23/21 15:59
30	05:23 21:21	06:17 20:15	07:13 18:59	08:08 16:49	08:08 16:00	08:35 15:03-15:24/21 16:00
31	05:24 21:19	06:19 20:13		07:11 16:47		08:35 15:03-15:25/22 16:01
Sonnenscheinstunden	515	462	384	330	259	232
Anzahl Minuten mit Schatten	558	227	0	0	414	722

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744**SHADOW - Kalender pro WEA****Berechnung: Zusatzbelastung WEA: 6 - WEA 6****Voraussetzungen für Berechnung des Schattenwurfs**

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 14:30-14:57/27 16:02 12:57-13:36/39	08:06 16:53	07:08 17:50	06:53 19:49	05:43 20:45	04:52 20:50-21:03/13 21:36 05:30-05:56/26
2	08:35 14:30-14:56/26 16:03 12:57-13:36/39	08:04 16:55	07:06 17:52	06:50 19:51	05:41 20:47	04:51 20:49-21:04/15 21:37 05:30-05:55/25
3	08:35 14:31-14:57/26 16:05 12:58-13:36/38	08:02 16:57	07:04 17:54	06:48 19:53	05:39 20:48	04:50 20:49-21:05/16 21:38 05:30-05:54/24
4	08:35 14:31-14:57/26 16:06 12:58-13:36/38	08:01 16:59	07:01 17:56	06:45 19:54	05:37 20:50	04:49 20:49-21:07/18 21:39 05:32-05:54/22
5	08:35 14:32-14:57/25 16:07 12:59-13:36/37	07:59 17:01	06:59 17:57	06:43 19:56	05:35 20:52	04:48 20:48-21:08/20 21:41 05:32-05:53/21
6	08:34 14:33-14:57/24 16:08 13:00-13:36/36	07:57 17:03	06:57 17:59	06:41 19:58	05:32 06:01-06:02/1 20:54	04:47 20:47-21:08/21 21:42 05:32-05:51/19
7	08:34 14:34-14:58/24 16:10 13:01-13:36/35	07:55 17:05	06:54 18:01	06:38 20:00	05:31 05:59-06:03/4 20:56	04:47 20:48-21:10/22 21:43 05:33-05:52/19
8	08:33 14:35-14:58/23 16:11 13:02-13:36/34	07:53 17:07	06:52 18:03	06:36 20:02	05:29 05:57-06:04/7 20:58	04:46 20:47-21:10/23 21:44 05:33-05:51/18
9	08:33 14:35-14:58/23 16:12 13:03-13:35/32	07:51 17:09	06:49 18:05	06:33 20:04	05:27 05:56-06:05/9 20:59	04:45 20:47-21:11/24 21:45 05:34-05:51/17
10	08:32 14:36-14:57/21 16:14 13:04-13:35/31	07:49 16:42-16:43/1 17:12	06:47 18:07	06:31 20:06	05:25 05:54-06:06/12 21:01	04:45 20:47-21:12/25 21:46 05:34-05:50/16
11	08:31 14:38-14:58/20 16:15 13:06-13:35/29	07:47 16:39-16:45/6 17:14	06:45 18:09	06:28 20:08	05:23 05:52-06:06/14 21:03	04:44 20:47-21:13/26 21:46 05:35-05:51/16
12	08:31 14:39-14:58/19 16:17 13:08-13:34/26	07:45 16:37-16:48/11 17:16	06:42 18:11	06:26 20:09	05:21 05:51-06:07/16 21:05	04:44 20:47-21:13/26 21:47 05:36-05:51/15
13	08:30 14:40-14:57/17 16:18 13:09-13:34/25	07:43 16:36-16:50/14 17:18	06:40 18:13	06:24 20:11	05:19 05:49-06:07/18 21:06	04:44 20:47-21:13/26 21:48 05:36-05:50/14
14	08:29 14:41-14:57/16 16:20 13:11-13:33/22	07:41 16:35-16:52/17 17:20	06:37 18:15	06:21 20:13	05:17 05:47-06:07/20 21:08	04:43 20:47-21:14/27 21:49 05:36-05:50/14
15	08:28 14:42-14:55/13 16:22 13:13-13:30/17	07:39 16:35-16:55/20 17:22	06:35 18:17	06:19 20:15	05:16 05:46-06:08/22 21:10	04:43 20:47-21:14/27 21:49 05:37-05:50/13
16	08:27 14:45-14:53/8 16:23 13:16-13:28/12	07:37 16:33-16:55/22 17:24	06:32 18:19	06:16 20:17	05:14 05:44-06:07/23 21:12	04:43 20:47-21:15/28 21:50 05:38-05:50/12
17	08:26 16:25	07:35 16:33-16:56/23 17:26	06:30 18:21	06:14 20:19	05:12 05:43-06:08/25 21:13	04:43 20:48-21:15/27 21:50 05:38-05:50/12
18	08:25 16:27	07:33 16:33-16:56/23 17:28	06:27 18:22	06:12 20:21	05:11 05:41-06:07/26 21:15	04:43 20:48-21:15/27 21:51 05:39-05:50/11
19	08:24 16:29	07:31 16:33-16:56/23 17:30	06:25 18:24	06:09 20:22	05:09 05:40-06:07/27 21:17	04:42 20:48-21:15/27 21:51 05:39-05:50/11
20	08:23 16:30	07:29 16:33-16:55/22 17:32	06:22 18:26	06:07 20:24	05:07 05:38-06:06/28 21:18	04:43 20:48-21:16/28 21:52 05:39-05:50/11
21	08:22 16:32	07:26 16:34-16:55/21 17:34	06:20 18:28	06:05 20:26	05:06 05:37-06:06/29 21:20	04:43 20:48-21:16/28 21:52 05:39-05:50/11
22	08:21 16:34	07:24 16:35-16:55/20 17:36	06:18 18:30	06:03 20:28	05:04 05:36-06:06/30 21:21	04:43 20:48-21:16/28 21:52 05:39-05:50/11
23	08:19 16:36	07:22 16:35-16:53/18 17:38	06:15 18:32	06:00 20:30	05:03 05:34-06:05/31 21:23	04:43 20:48-21:16/28 21:52 05:40-05:51/11
24	08:18 16:38	07:20 16:36-16:52/16 17:40	06:13 18:34	05:58 20:32	05:02 05:33-06:05/32 21:25	04:43 20:49-21:17/28 21:53 05:40-05:51/11
25	08:17 16:40	07:18 16:39-16:50/11 17:42	06:10 18:36	05:56 20:34	05:00 05:32-06:04/32 21:26	04:44 20:49-21:16/27 21:53 05:40-05:51/11
26	08:15 16:42	07:15 16:43-16:45/2 17:44	06:08 18:38	05:54 20:36	04:59 05:31-06:04/33 21:28	04:44 20:50-21:17/27 21:53 05:41-05:52/11
27	08:14 16:44	07:13 17:46	06:05 18:39	05:51 20:37	04:58 05:30-06:03/33 21:29	04:44 20:50-21:17/27 21:53 05:40-05:52/12
28	08:12 16:45	07:11 17:48	06:03 18:41	05:49 20:39	04:56 05:29-06:02/33 21:30	04:45 20:49-21:16/27 21:53 05:41-05:53/12
29	08:11 16:47		06:00 18:43	05:47 20:41	04:55 20:56-21:00/4 21:32	04:45 20:50-21:17/27 21:52 05:40-05:53/13
30	08:09 16:49		05:58 18:45	05:45 20:43	04:54 20:53-21:01/8 21:33	04:46 20:51-21:18/27 21:52 05:40-05:54/14
31	08:07 16:51		06:55 19:47		04:53 20:52-21:02/10 21:34	
Sonnenscheinstunden	248	271	365	419	494	511
Anzahl Minuten mit Schatten	828	270	0	0	615	1193

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

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	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
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 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender pro WEA**Berechnung: Zusatzbelastung WEA: 6 - WEA 6****Voraussetzungen für Berechnung des Schattenwurfs**

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Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Jul	August	September	Oktober	November	Dezember
1	04:47 20:51-21:17/26 21:52 05:39-05:54/15	05:26 05:59-06:17/18 21:17	06:21 07:15 20:11 18:56		07:13 16:08-16:15/7 16:45	08:09 14:21-14:39/18 15:59 12:50-13:16/26
2	04:47 20:51-21:17/26 21:52 05:40-05:55/15	05:28 06:01-06:17/16 21:15	06:23 07:16 20:08 18:54		07:15 16:10-16:13/3 16:43	08:11 14:20-14:39/19 15:58 12:49-13:16/27
3	04:48 20:52-21:18/26 21:51 05:40-05:56/16	05:29 06:02-06:16/14 21:14	06:24 07:18 20:06 18:51		07:17 16:41	08:12 14:20-14:41/21 15:57 12:48-13:18/30
4	04:49 20:52-21:17/25 21:51 05:40-05:56/16	05:31 06:04-06:16/12 21:12	06:26 07:20 20:03 18:49		07:19 16:39	08:14 14:20-14:42/22 15:57 12:48-13:20/32
5	04:50 20:52-21:16/24 21:50 05:39-05:56/17	05:33 06:05-06:15/10 21:10	06:28 07:22 20:01 18:46		07:21 16:37	08:15 14:19-14:42/23 15:56 12:47-13:20/33
6	04:51 20:53-21:16/23 21:50 05:39-05:57/18	05:35 06:07-06:14/7 21:08	06:30 07:24 19:58 18:44		07:23 16:35	08:17 14:20-14:43/23 15:56 12:47-13:22/35
7	04:51 20:54-21:16/22 21:49 05:39-05:58/19	05:36 06:09-06:13/4 21:06	06:32 07:26 19:56 18:42		07:25 16:33	08:18 14:20-14:44/24 15:55 12:47-13:22/35
8	04:52 20:54-21:15/21 21:48 05:39-05:58/19	05:38 06:10-06:11/1 21:04	06:33 07:27 19:54 18:39		07:27 16:31	08:19 14:20-14:45/25 15:55 12:47-13:24/37
9	04:53 20:55-21:14/19 21:48 05:39-06:00/21	05:40 21:02	06:35 07:29 19:51 18:37		07:29 16:29	08:21 14:20-14:45/25 15:54 12:47-13:24/37
10	04:55 20:56-21:14/18 21:47 05:38-06:01/23	05:42 21:00	06:37 07:31 19:49 18:34		07:31 16:28	08:22 14:20-14:45/25 15:54 12:46-13:24/38
11	04:56 20:57-21:13/16 21:46 05:38-06:02/24	05:43 20:58	06:39 07:33 19:46 18:32		07:33 16:26	08:23 14:21-14:47/26 15:53 12:47-13:26/39
12	04:57 20:57-21:12/15 21:45 05:38-06:03/25	05:45 20:56	06:41 07:35 19:44 18:30		07:35 16:24	08:24 14:21-14:47/26 15:53 12:47-13:27/40
13	04:58 20:58-21:11/13 21:44 05:38-06:04/26	05:47 20:54	06:42 07:37 19:41 18:27		07:37 16:22	08:25 14:21-14:48/27 15:53 12:47-13:27/40
14	04:59 21:00-21:10/10 21:43 05:38-06:05/27	05:49 20:52	06:44 07:39 19:39 18:25		07:39 16:21	08:26 14:21-14:48/27 15:53 12:47-13:28/41
15	05:00 21:01-21:09/8 21:42 05:37-06:07/30	05:50 20:50	06:46 07:41 19:36 18:22		07:41 16:19	08:27 14:22-14:49/27 15:53 12:48-13:28/40
16	05:02 21:06-21:08/2 21:41 05:38-06:10/32	05:52 20:47	06:48 07:42 19:34 18:20		07:43 16:18	08:28 14:22-14:49/27 15:53 12:48-13:29/41
17	05:03 05:38-06:11/33 21:40 20:45	05:54 20:45	06:49 07:44 19:31 18:18		07:44 16:16	08:29 14:23-14:50/27 15:53 12:48-13:30/42
18	05:04 05:39-06:12/33 21:39 20:43	05:56 20:43	06:51 07:46 17:10-17:21/11 19:29 18:15		07:46 16:14	08:30 14:23-14:50/27 15:53 12:49-13:30/41
19	05:06 05:40-06:13/33 21:37 20:41	05:58 20:41	06:53 07:48 17:08-17:23/15 19:26 18:13		07:48 16:13	08:31 14:23-14:50/27 15:53 12:48-13:30/42
20	05:07 05:42-06:14/32 21:36 20:39	05:59 20:39	06:55 07:50 17:06-17:24/18 19:24 18:11		07:50 16:12	08:32 14:24-14:51/27 15:54 12:49-13:31/42
21	05:09 05:43-06:15/32 21:35 20:36	06:01 20:36	06:57 07:52 17:05-17:25/20 19:21 18:09		07:52 16:10	08:32 14:25-14:52/27 15:54 12:50-13:32/42
22	05:10 05:44-06:15/31 21:33 20:34	06:03 20:34	06:58 07:54 17:04-17:26/22 19:19 18:06		07:54 16:09	08:33 14:24-14:52/28 15:54 12:50-13:32/42
23	05:12 05:46-06:16/30 21:32 20:32	06:05 20:32	07:00 07:56 17:03-17:26/23 19:16 18:04		07:55 16:08	08:33 14:25-14:53/28 15:55 12:51-13:33/42
24	05:13 05:47-06:16/29 21:30 20:29	06:07 20:29	07:02 07:58 17:03-17:26/23 19:14 18:02		07:57 16:06	08:34 14:26-14:53/27 15:55 12:51-13:33/42
25	05:15 05:49-06:17/28 21:29 20:27	06:08 20:27	07:04 08:00 17:03-17:26/23 19:11 18:00		07:59 16:05	08:34 14:26-14:53/27 15:56 12:51-13:33/42
26	05:16 05:50-06:17/27 21:27 20:25	06:10 20:25	07:06 08:02 17:03-17:25/22 19:09 17:57		08:01 16:04	08:35 14:27-14:54/27 15:57 12:52-13:34/42
27	05:18 05:52-06:18/26 21:26 20:22	06:12 20:22	07:07 07:04 16:03-16:25/22 19:06 16:55		08:03 14:25-14:31/6 16:03 12:57-13:05/8	08:35 14:27-14:54/27 15:57 12:53-13:34/41
28	05:20 05:53-06:18/25 21:24 20:20	06:14 20:20	07:09 07:05 16:03-16:24/21 19:04 16:53		08:04 14:23-14:34/11 16:02 12:54-13:09/15	08:35 14:28-14:55/27 15:58 12:53-13:35/42
29	05:21 05:55-06:18/23 21:22 20:18	06:15 20:18	07:11 07:07 16:04-16:22/18 19:01 16:51		08:06 14:22-14:36/14 16:01 12:52-13:11/19	08:35 14:28-14:55/27 15:59 12:54-13:35/41
30	05:23 05:56-06:18/22 21:21 20:15	06:17 20:15	07:13 07:09 16:05-16:20/15 18:59 16:49		08:07 14:21-14:37/16 16:00 12:51-13:14/23	08:35 14:29-14:56/27 16:00 12:55-13:35/40
31	05:24 05:58-06:18/20 21:19	06:19 20:13	07:11 16:06-16:18/12 16:47			08:35 14:29-14:56/27 16:01 12:55-13:36/41
Sonnenscheinstunden	515	462	384	330	259	232
Anzahl Minuten mit Schatten	1061	82	0	265	122	1987

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdauf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744**SHADOW - Kalender pro WEA****Berechnung: Zusatzbelastung WEA: 7 - WEA 7****Voraussetzungen für Berechnung des Schattenwurfs**

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:35 16:02	08:06 16:53	07:08 17:50	06:53 19:49	05:43 19:41-20:09/28 20:45 06:11-06:48/37	04:52 20:49-21:03/14 21:36 05:25-05:27/2	04:47 20:51-21:18/27 21:52 05:22-05:37/15	06:26 06:10-06:39/29 21:17 20:01-20:10/9	06:21 07:15 20:11 18:56	07:13 16:45 18:51 15:59	08:09 16:15 19:11 15:01	08:09 16:15 19:11 15:01
2	08:35 16:03	08:04 16:55	07:06 17:52	06:50 19:51	05:41 19:41-20:09/28 20:47 06:09-06:47/38	04:51 20:49-21:04/15 21:37 05:24-05:28/4	04:47 20:52-21:18/26 21:52 05:23-05:37/14	06:26 06:10-06:39/29 21:15 06:10-06:41/31	06:23 07:16 20:08 18:54	07:15 16:45 18:51 15:58	08:09 16:15 19:11 15:01	08:09 16:15 19:11 15:01
3	08:35 16:05	08:02 16:57	07:04 17:54	06:48 19:53	05:39 19:42-20:10/28 20:48 06:07-06:45/39	04:50 20:48-21:05/17 21:38 05:23-05:28/5	04:48 20:52-21:18/26 21:51 05:24-05:38/14	06:30 19:58-20:12/14 21:14 06:09-06:41/32	06:24 07:18 20:06 18:51	07:17 16:47 18:51 15:58	08:09 16:15 19:11 15:01	08:09 16:15 19:11 15:01
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7	08:34 16:10	07:55 17:05	06:54 18:01	06:38 20:00	05:31 19:43-20:07/24 20:56 05:59-06:41/42	04:47 20:48-21:10/22 21:43 05:21-05:31/10	04:52 20:54-21:16/22 21:49 05:27-05:37/10	06:36 19:53-20:17/24 21:06 06:09-06:51/42	06:32 07:26 20:06 18:42	07:25 16:33 18:51 15:55	08:09 16:15 19:11 15:01	08:09 16:15 19:11 15:01
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9	08:33 16:12	07:51 17:10	06:49 18:05	06:33 20:04	05:27 19:44-20:04/20 20:59 05:59-06:37/38	04:46 20:48-21:11/23 21:45 05:20-05:32/12	04:54 20:55-21:14/19 21:48 05:29-05:37/8	06:40 19:51-20:18/27 21:02 06:12-06:53/41	06:35 07:29 20:01 18:37	07:29 16:29 18:51 15:54	08:09 16:15 19:11 15:01	08:09 16:15 19:11 15:01
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Projekt: 19-095-GBK-02	Beschreibung: Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kesdorf	Lizenzierter Anwender: T&H Ingenieure GmbH Bremerhavener Heerstraße 10 DE-28717 Bremen +49 (0) 421 79 400 600 info@th-ingenieure.de Berechnet: 20.08.2019 10:57/3.2.744
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SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 8 - WEA 8

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:35 16:02	08:06 15:34-15:55/21 16:53	07:08 17:50	06:53 19:49	05:43 20:45	04:52 21:36	04:47 21:52	05:26 21:17	06:21 20:11	07:15 18:56	07:13 16:45	08:09 15:11-15:25/14 15:59
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3	08:35 16:05	08:02 15:37-15:52/15 16:57	07:04 17:54	06:48 19:53	05:39 20:48	04:50 21:38	04:48 21:51	05:29 21:14	06:24 20:06	07:18 18:51	07:17 16:41	08:12 15:14-15:23/9 15:57
4	08:35 16:06	08:01 15:40-15:51/11 16:59	07:01 17:56	06:45 19:54	05:37 20:50	04:49 21:39	04:49 21:51	05:31 21:12	06:26 20:03	07:20 18:49	07:19 16:39	08:14 15:14-15:22/8 15:57
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7	08:34 15:34-15:35/1 16:10	07:55 17:05	06:54 18:01	06:38 20:00	05:30 20:56	04:47 21:43	04:51 21:49	05:36 21:06	06:32 19:56	07:26 18:42	07:25 16:33	08:18 15:55
8	08:33 15:33-15:36/3 16:11	07:53 17:07	06:52 18:03	06:36 20:02	05:29 20:58	04:46 21:44	04:52 21:48	05:38 21:04	06:33 19:53	07:27 18:39	07:27 15:11-15:20/9 16:31	08:19 15:54
9	08:33 15:31-15:37/6 16:12	07:51 17:09	06:49 18:05	06:33 20:04	05:27 20:59	04:45 21:45	04:53 21:48	05:40 21:02	06:35 19:51	07:29 18:37	07:29 15:08-15:22/14 16:29	08:21 15:54
10	08:32 15:31-15:39/8 16:14	07:49 17:11	06:47 18:07	06:31 20:06	05:25 21:01	04:45 21:46	04:55 21:47	05:42 21:00	06:37 19:49	07:31 18:34	07:31 15:07-15:24/17 16:28	08:22 15:54
11	08:31 15:31-15:41/10 16:15	07:47 17:14	06:45 18:09	06:28 20:07	05:23 21:03	04:44 21:46	04:56 21:46	05:43 20:58	06:39 19:46	07:33 18:32	07:33 15:05-15:25/20 16:26	08:23 15:53
12	08:31 15:30-15:43/13 16:17	07:45 17:16	06:42 18:11	06:26 20:09	05:21 21:05	04:44 21:47	04:57 21:45	05:45 20:56	06:40 19:44	07:35 18:30	07:35 15:05-15:27/22 16:24	08:24 15:53
13	08:30 15:30-15:45/15 16:18	07:43 17:18	06:40 18:13	06:24 20:11	05:19 21:06	04:44 21:48	04:58 21:44	05:47 20:54	06:42 19:41	07:37 18:27	07:37 15:05-15:28/23 16:22	08:25 15:53
14	08:29 15:30-15:47/17 16:20	07:41 17:20	06:37 18:15	06:21 20:13	05:17 21:08	04:43 21:49	04:59 21:43	05:49 20:52	06:44 19:39	07:39 18:25	07:39 15:04-15:28/24 16:21	08:26 15:53
15	08:28 15:29-15:48/19 16:22	07:39 17:22	06:35 18:17	06:19 20:15	05:16 21:10	04:43 21:49	04:59 21:42	05:50 20:50	06:46 19:36	07:41 18:22	07:41 15:04-15:29/25 16:19	08:27 15:53
16	08:27 15:29-15:50/21 16:23	07:37 17:24	06:32 18:19	06:16 20:17	05:14 21:12	04:43 21:50	04:59 21:41	05:52 20:47	06:48 19:34	07:42 18:20	07:42 15:03-15:29/26 16:18	08:28 15:53
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18	08:25 15:29-15:54/25 16:27	07:33 17:28	06:27 18:22	06:12 20:21	05:11 21:15	04:43 21:51	04:59 21:38	05:56 20:43	06:51 19:29	07:46 18:15	07:46 15:03-15:30/27 16:14	08:30 15:53
19	08:24 15:28-15:54/26 16:29	07:31 17:30	06:25 18:24	06:09 20:22	05:09 21:17	04:42 21:51	04:58 21:37	05:58 20:41	06:53 19:26	07:48 18:13	07:48 15:03-15:30/27 16:13	08:31 15:53
20	08:23 15:29-15:55/26 16:30	07:29 17:32	06:22 18:26	06:07 20:24	05:07 21:18	04:43 21:52	04:57 21:36	05:59 20:39	06:55 19:24	07:50 18:11	07:50 15:03-15:30/27 16:12	08:31 15:54
21	08:22 15:29-15:56/27 16:32	07:26 17:34	06:20 18:28	06:05 20:26	05:06 21:20	04:43 21:52	04:59 21:35	06:01 20:36	06:57 19:21	07:52 18:09	07:52 15:04-15:31/27 16:10	08:32 15:54
22	08:21 15:29-15:56/27 16:34	07:24 17:36	06:18 18:30	06:03 20:28	05:04 21:21	04:43 21:52	04:59 21:33	06:03 20:34	06:58 19:19	07:54 18:06	07:54 15:04-15:31/27 16:09	08:33 15:54
23	08:19 15:29-15:57/28 16:36	07:22 17:38	06:15 18:32	06:00 20:30	05:03 21:23	04:43 21:52	04:59 21:32	06:05 20:32	06:58 19:16	07:56 18:04	07:56 15:04-15:31/27 16:08	08:33 15:54
24	08:18 15:29-15:56/27 16:38	07:20 17:40	06:13 18:34	05:58 20:32	05:02 21:24	04:43 21:53	04:59 21:30	06:07 20:29	06:58 19:14	07:58 18:02	07:58 15:05-15:31/26 16:06	08:34 15:55
25	08:17 15:29-15:56/27 16:40	07:18 17:42	06:10 18:36	05:56 20:34	05:00 21:26	04:43 21:53	04:59 21:29	06:08 20:27	06:58 19:11	07:59 18:00	07:59 15:06-15:31/25 16:05	08:34 15:56
26	08:15 15:30-15:57/27 16:42	07:15 17:44	06:08 18:38	05:54 20:35	04:59 21:27	04:44 21:53	04:59 21:27	06:10 20:25	06:58 19:09	08:02 17:57	08:02 15:06-15:31/25 16:04	08:35 15:57
27	08:14 15:30-15:57/27 16:43	07:13 17:46	06:05 18:39	05:51 20:37	04:58 21:29	04:44 21:53	04:59 21:26	06:12 20:22	07:07 19:06	08:04 16:55	08:04 15:07-15:29/22 16:03	08:35 15:57
28	08:12 15:30-15:56/26 16:45	07:11 17:48	06:03 18:41	05:49 20:39	04:56 21:30	04:45 21:53	04:59 21:24	06:14 20:20	07:09 19:04	08:06 16:53	08:06 15:08-15:28/20 16:02	08:35 15:58
29	08:11 15:32-15:57/25 16:47	07:09 17:50	06:00 18:43	05:47 20:41	04:55 21:32	04:45 21:52	04:59 21:22	06:15 20:18	07:11 19:01	08:07 16:51	08:07 15:09-15:27/18 16:01	08:35 15:59
30	08:09 15:32-15:56/24 16:49	07:07 17:52	05:58 18:45	05:45 20:43	04:54 21:33	04:46 21:52	04:59 21:21	06:17 20:15	07:13 18:59	08:09 16:49	08:09 15:10-15:26/16 16:00	08:35 16:00
31	08:07 15:33-15:56/23 16:51	07:05 17:57	05:55 18:47	05:43 20:45	04:53 21:34	04:47 21:54	04:59 21:19	06:19 20:13	07:15 18:57	08:11 16:47	08:11 15:11-15:25/14 16:01	08:35 16:01
Sonnenscheinstunden	248	271	365	419	494	511	515	462	384	330	259	232
Anzahl Minuten mit Schatten	501	66	0	0	0	0	0	0	0	0	521	50

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten

Projekt: 19-095-GBK-02	Beschreibung: Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kesdorf	Lizenzierter Anwender: T&H Ingenieure GmbH Bremerhavener Heerstraße 10 DE-28717 Bremen +49 (0) 421 79 400 600 info@th-ingenieure.de Berechnet: 20.08.2019 10:57/3.2.744
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SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 9 - WEA 9

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2019
Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:
Die Sonne scheint täglich von Sonnenauf- bis -untergang
Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 16:02	08:06 16:53	07:08 17:50	06:53 19:09-19:23/14 19:49 07:18-07:44/26	05:43 20:15-20:16/1 06:35-07:13/38 20:45 19:48-20:13/25	04:52 20:37-21:03/26 05:25-05:47/22 21:36 20:11-20:28/17
2	08:35 16:03	08:04 16:55	07:06 17:52	06:50 19:09-19:26/17 19:51 07:16-07:46/30	05:41 19:48-20:18/30 20:47 06:35-07:11/36	04:51 20:37-21:04/27 05:24-05:48/24 21:37 20:12-20:27/15
3	08:35 16:05	08:02 16:57	07:04 17:54	06:48 19:07-19:27/20 19:53 07:14-07:47/33	05:39 19:49-20:21/32 20:48 06:36-07:10/34	04:50 20:37-21:04/27 05:23-05:48/25 21:38 20:13-20:26/13
4	08:35 16:06	08:01 16:59	07:01 17:56	06:45 19:07-19:29/22 19:54 07:11-07:47/36	05:37 19:49-20:22/33 20:50 06:37-07:09/32	04:49 20:38-21:05/27 05:23-05:49/26 21:39 20:16-20:26/10
5	08:35 16:07	07:59 17:01	06:59 17:58	06:43 19:07-19:30/23 19:56 07:09-07:48/39	05:35 19:50-20:24/34 20:52 06:37-07:08/31	04:48 20:38-21:05/27 05:22-05:50/28 21:41 20:17-20:23/6
6	08:34 16:08	07:57 17:03	06:57 17:59	06:41 19:06-19:29/23 19:58 07:06-07:47/41	05:33 19:50-20:25/35 20:54 06:38-07:06/28	04:47 20:38-21:06/28 21:42 05:21-05:50/29
7	08:34 16:10	07:55 17:05	06:54 18:01	06:38 19:07-19:29/22 20:00 07:04-07:48/44	05:31 19:51-20:27/36 20:56 06:39-07:05/26	04:47 20:38-21:06/28 21:43 05:21-05:51/30
8	08:33 16:11	07:53 17:08	06:52 18:03	06:36 19:06-19:27/21 20:02 07:01-07:47/46	05:29 19:52-20:28/36 20:58 06:41-07:03/22	04:46 20:38-21:05/27 21:44 05:20-05:51/31
9	08:33 16:12	07:51 17:10	06:49 18:05	06:33 19:07-19:26/19 20:04 06:59-07:47/48	05:27 19:53-20:31/38 20:59 06:43-07:01/18	04:46 20:38-21:06/28 21:45 05:20-05:51/31
10	08:32 16:14	07:49 17:12	06:47 18:07	06:31 19:09-19:25/16 20:06 06:57-07:47/50	05:25 19:55-20:32/37 21:01 06:46-06:58/12	04:45 20:38-21:05/27 21:46 05:19-05:51/32
11	08:31 16:15	07:47 17:14	06:45 18:09	06:28 19:10-19:23/13 20:08 06:54-07:46/52	05:23 20:04-20:33/29 21:03 19:59-20:01/2	04:44 20:39-21:06/27 21:46 05:19-05:52/33
12	08:31 16:17	07:46 17:16	06:42 18:11	06:26 19:13-19:20/7 20:09 06:52-07:46/54	05:21 20:03-20:33/30 21:05	04:44 20:39-21:07/28 21:47 05:19-05:53/34
13	08:30 16:19	07:43 17:18	06:40 18:13	06:24 06:50-07:46/56 20:11	05:19 20:03-20:34/31 21:06	04:44 20:39-21:06/27 21:48 05:18-05:52/34
14	08:29 16:20	07:41 17:20	06:37 18:15	06:21 06:47-07:45/58 20:13	05:17 20:03-20:33/30 21:08	04:43 20:39-21:06/27 21:49 05:18-05:53/35
15	08:28 16:22	07:39 17:22	06:35 18:17	06:19 06:45-07:44/59 20:15	05:16 20:03-20:34/31 21:10	04:43 20:40-21:07/27 21:49 05:18-05:53/35
16	08:27 16:23	07:37 17:24	06:32 18:19	06:17 06:43-07:44/61 20:17	05:14 20:03-20:34/31 21:12	04:43 20:40-21:07/27 21:50 05:18-05:53/35
17	08:26 16:25	07:35 17:26	06:30 18:21	06:14 06:40-07:42/62 20:19	05:12 20:03-20:34/31 21:13	04:43 20:40-21:07/27 21:50 05:18-05:54/36
18	08:25 16:27	07:33 17:28	06:27 18:23	06:12 06:38-07:41/63 20:21	05:11 20:03-20:33/30 21:15	04:43 20:41-21:07/26 21:51 05:18-05:54/36
19	08:24 16:29	07:31 17:30	06:25 18:24	06:10 06:36-07:40/64 20:22	05:09 20:03-20:34/31 21:17	04:43 20:41-21:08/27 21:51 05:18-05:54/36
20	08:23 16:30	07:29 17:32	06:23 18:26	06:07 06:36-07:39/63 20:24	05:08 20:03-20:33/30 21:18	04:43 20:41-21:08/27 21:52 05:18-05:54/36
21	08:22 16:32	07:27 17:34	06:20 18:28	06:05 06:35-07:37/62 20:26	05:06 20:04-20:33/29 21:20	04:43 20:41-21:08/27 21:52 05:18-05:55/37
22	08:21 16:34	07:24 17:36	06:18 18:30	06:03 19:58-20:01/3 20:28	05:04 20:41-20:51/10 21:21	04:43 20:41-21:08/27 21:52 05:18-05:55/37
23	08:19 16:36	07:22 17:38	06:15 18:32	06:00 19:55-20:03/8 20:30	05:03 20:40-20:51/11 05:34-05:36/2 21:23	04:43 20:42-21:09/27 21:52 05:19-05:56/37
24	08:18 16:38	07:20 17:40	06:13 18:34	05:58 19:53-20:05/12 20:32	05:02 20:39-20:53/14 05:33-05:39/6 21:25	04:43 20:42-21:09/27 21:53 05:19-05:55/36
25	08:17 16:40	07:18 17:42	06:10 18:36	05:56 19:52-20:07/15 20:34	05:00 20:39-20:54/15 05:32-05:41/9 21:26	04:44 20:42-21:09/27 21:53 05:19-05:55/36
26	08:15 16:42	07:15 17:44	06:08 18:38	05:54 19:51-20:08/17 20:36	04:59 20:39-20:56/17 05:31-05:42/11 21:28	04:44 20:43-21:09/26 21:53 05:20-05:56/36
27	08:14 16:44	07:13 17:46	06:05 18:39	05:51 19:51-20:10/19 20:37	04:58 20:38-20:57/19 05:30-05:43/13 21:29	04:44 20:42-21:09/27 21:53 05:20-05:56/36
28	08:12 16:46	07:11 17:48	06:03 18:41	05:49 19:50-20:12/22 20:39	04:56 20:38-20:59/21 05:29-05:45/16 21:30	04:45 20:42-21:09/27 21:53 05:21-05:56/35
29	08:11 16:47		06:00 18:16-18:19/3 18:43	05:47 19:49-20:13/24 20:41	04:55 20:38-21:00/22 05:28-05:45/17 21:32	04:45 20:43-21:10/27 21:52 05:21-05:56/35
30	08:09 16:49		05:58 18:13-18:20/7 18:45	05:45 19:48-20:13/25 20:43	04:54 20:38-21:01/23 05:27-05:46/19 21:33	04:46 20:43-21:10/27 21:52 05:22-05:57/35
31	08:08 16:51		06:55 19:11-19:22/11 19:47		04:53 20:38-21:02/24 05:26-05:47/21 21:34	
Sonnenscheinstunden	248	271	365	419	494	511
Anzahl Minuten mit Schatten	0	0	83	1851	1492	1860

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 9 - WEA 9

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober	November	Dezember
1	04:47 20:43-21:10/27 21:52 05:22-05:56/34	05:26 20:13-20:44/31 21:17	06:21 06:50-07:45/55 20:11	07:15 18:56	07:13 16:45	08:09 15:59
2	04:47 20:43-21:10/27 21:52 05:23-05:56/33	05:28 20:14-20:44/30 21:15	06:23 19:10-19:21/11 20:08 06:52-07:45/53	07:16 18:54	07:15 16:43	08:11 15:58
3	04:48 20:44-21:11/27 21:51 05:24-05:57/33	05:30 20:14-20:43/29 21:14	06:24 19:07-19:23/16 20:06 06:54-07:45/51	07:18 18:51	07:17 16:41	08:12 15:58
4	04:49 20:43-21:10/27 21:51 05:25-05:57/32	05:31 20:06-20:42/36 21:12 06:56-07:08/12	06:26 19:05-19:23/18 20:03 06:56-07:45/49	07:20 18:51	07:19 16:39	08:14 15:57
5	04:50 20:43-21:11/28 21:50 05:25-05:56/31	05:33 20:03-20:40/37 21:10 06:53-07:10/17	06:28 19:04-19:24/20 20:01 06:57-07:44/47	07:22 18:47	07:21 16:37	08:15 15:56
6	04:51 20:44-21:11/27 21:50 05:26-05:56/30	05:35 20:02-20:39/37 21:08 06:51-07:13/22	06:30 19:03-19:25/22 19:58 06:59-07:44/45	07:24 18:44	07:23 16:35	08:17 15:56
7	04:52 20:44-21:11/27 21:49 05:27-05:57/30	05:36 20:01-20:37/36 21:06 06:50-07:15/25	06:32 19:03-19:25/22 19:56 07:01-07:44/43	07:26 18:42	07:25 16:33	08:18 15:55
8	04:53 20:44-21:12/28 21:48 05:28-05:57/29	05:38 20:00-20:35/35 21:04 06:48-07:15/27	06:33 19:01-19:24/23 19:54 07:02-07:42/40	07:28 18:39	07:27 16:31	08:19 15:55
9	04:54 20:45-21:12/27 05:29-05:56/27 21:48 20:24-20:31/7	05:40 19:59-20:33/34 21:02 06:47-07:17/30	06:35 19:01-19:24/23 19:51 07:04-07:41/37	07:29 18:37	07:29 16:29	08:21 15:54
10	04:55 20:45-21:12/27 05:30-05:56/26 21:47 20:22-20:33/11	05:42 19:58-20:31/33 21:00 06:46-07:18/32	06:37 19:01-19:22/21 19:49 07:06-07:40/34	07:31 18:34	07:31 16:28	08:22 15:54
11	04:56 20:45-21:12/27 05:31-05:56/25 21:46 20:21-20:34/13	05:43 19:58-20:29/31 20:58 06:44-07:18/34	06:39 19:00-19:19/19 19:46 07:08-07:39/31	07:33 18:32	07:33 16:26	08:23 15:54
12	04:57 20:45-21:12/27 05:32-05:56/24 21:45 20:20-20:35/15	05:45 19:58-20:28/30 20:56 06:44-07:19/35	06:41 19:01-19:17/16 19:44 07:09-07:37/28	07:35 18:30	07:35 16:24	08:24 15:53
13	04:58 20:45-21:11/26 05:33-05:55/22 21:44 20:19-20:36/17	05:47 20:23-20:25/2 06:43-07:21/38 20:54 19:57-20:21/24	06:42 19:02-19:15/13 19:41 07:11-07:36/25	07:37 18:27	07:37 16:22	08:25 15:53
14	04:59 20:45-21:10/25 05:34-05:55/21 21:43 20:18-20:37/19	05:49 19:57-20:22/25 20:52 06:42-07:22/40	06:44 19:03-19:13/10 19:39 07:13-07:34/21	07:39 18:25	07:39 16:21	08:26 15:53
15	05:01 20:46-21:09/23 05:36-05:55/19 21:42 20:17-20:38/21	05:51 19:57-20:22/25 20:50 06:42-07:24/42	06:46 19:04-19:09/5 19:36 07:15-07:32/17	07:41 18:22	07:41 16:19	08:27 15:53
16	05:02 20:47-21:09/22 05:37-05:54/17 21:41 20:18-20:39/21	05:52 19:56-20:19/23 20:47 06:40-07:25/45	06:48 07:16-07:28/12 19:34	07:42 18:20	07:43 16:18	08:28 15:53
17	05:03 20:47-21:08/21 05:38-05:53/15 21:40 20:17-20:40/23	05:54 19:57-20:17/20 20:45 06:40-07:26/46	06:49 07:18-07:22/4 19:31	07:44 18:18	07:44 16:16	08:29 15:53
18	05:05 20:47-21:06/19 05:39-05:52/13 21:39 20:16-20:40/24	05:56 19:58-20:15/17 20:43 06:40-07:28/48	06:51 19:29 19:29	07:46 18:15	07:46 16:15	08:30 15:53
19	05:06 20:48-21:05/17 05:40-05:51/11 21:37 20:15-20:41/26	05:58 19:58-20:13/15 20:41 06:39-07:28/49	06:53 19:26 19:26	07:48 18:13	07:48 16:13	08:31 15:53
20	05:07 20:49-21:04/15 05:42-05:51/9 21:36 20:16-20:42/26	05:59 19:59-20:11/12 20:39 06:39-07:32/53	06:55 19:24 19:24	07:50 18:11	07:50 16:12	08:32 15:54
21	05:09 20:49-21:03/14 05:43-05:49/6 21:35 20:15-20:42/27	06:01 20:00-20:09/9 20:36 06:39-07:37/58	06:57 19:21 19:21	07:52 18:09	07:52 16:10	08:32 15:54
22	05:10 20:50-21:01/11 05:45-05:47/2 21:33 20:14-20:42/28	06:03 20:01-20:06/5 20:34 06:39-07:39/60	06:58 19:19 19:19	07:54 18:06	07:54 16:09	08:33 15:55
23	05:12 20:51-21:01/10 21:32 20:14-20:43/29	06:05 06:39-07:40/61 20:32	07:00 19:16 19:16	07:56 18:04	07:56 16:08	08:33 15:55
24	05:13 20:14-20:43/29 21:30 20:52-20:59/7	06:07 06:39-07:42/63 20:29	07:02 19:14 19:14	07:58 18:02	07:58 16:06	08:34 15:56
25	05:15 20:14-20:44/30 21:29 20:55-20:58/3	06:08 06:40-07:43/63 20:27	07:04 19:11 19:11	08:00 18:00	07:59 16:05	08:34 15:56
26	05:16 20:13-20:44/31 21:27	06:10 06:40-07:43/63 20:25	07:06 19:09 19:09	08:02 17:58	08:01 16:04	08:35 15:57
27	05:18 20:14-20:44/30 21:26	06:12 06:42-07:44/62 20:22	07:07 19:06 19:06	07:04 16:55	08:03 16:03	08:35 15:58
28	05:20 20:13-20:44/31 21:24	06:14 06:44-07:45/61 20:20	07:09 19:04 19:04	07:06 16:53	08:04 16:02	08:35 15:58
29	05:21 20:13-20:44/31 21:22	06:16 06:45-07:45/60 20:18	07:11 19:01 19:01	07:07 16:51	08:06 16:01	08:35 15:59
30	05:23 20:13-20:44/31 21:21	06:17 06:47-07:45/58 20:15	07:13 18:59 18:59	07:09 16:49	08:08 16:00	08:35 16:00
31	05:24 20:14-20:44/30 21:19	06:19 06:49-07:46/57 20:13		07:11 16:47 16:47		08:35 16:01
Sonnenscheinstunden	514	462	384	330	259	232
Anzahl Minuten mit Schatten	1578	1837	831	0	0	0

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 10 - WEA 10

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 16:02	08:06 16:53	07:08 17:50	06:53 19:09-19:22/13 19:49 07:18-07:39/21	05:43 06:11-06:26/15 20:45	04:52 20:14-21:03/49 21:36
2	08:35 16:03	08:04 16:55	07:06 17:52	06:50 19:06-19:25/19 19:51 07:16-07:39/23	05:41 06:09-06:26/17 20:47	04:51 20:13-21:04/51 21:37
3	08:35 16:05	08:02 16:57	07:04 17:54	06:48 19:03-19:27/24 19:53 07:14-07:39/25	05:39 06:07-06:26/19 20:48	04:50 20:13-21:05/52 21:38
4	08:35 16:06	08:01 16:59	07:01 17:56	06:45 19:01-19:28/27 19:54 07:11-07:37/26	05:37 06:05-06:25/20 20:50	04:49 20:14-21:07/53 21:39
5	08:35 16:07	07:59 17:01	06:59 17:57	06:43 19:00-19:30/30 19:56 07:09-07:36/27	05:35 06:03-06:25/22 20:52	04:48 20:14-21:08/54 21:41
6	08:34 16:08	07:57 17:03	06:57 17:59	06:41 18:58-19:30/32 19:58 07:06-07:34/28	05:33 06:01-06:24/23 20:54	04:48 20:13-21:08/55 21:42
7	08:34 16:10	07:55 17:05	06:54 18:01	06:38 18:57-19:31/34 20:00 07:04-07:32/28	05:31 05:59-06:24/25 20:56	04:47 20:14-21:10/56 21:43
8	08:33 16:11	07:53 17:07	06:52 18:03	06:36 18:56-19:31/35 20:02 07:01-07:28/27	05:29 05:57-06:23/26 20:58	04:46 20:14-21:10/56 21:44
9	08:33 16:12	07:51 17:09	06:49 18:05	06:33 18:55-19:32/37 20:04 06:59-07:24/25	05:27 05:56-06:23/27 20:59	04:46 20:14-21:11/57 21:45
10	08:32 16:14	07:49 17:12	06:47 18:07	06:31 18:55-19:32/37 20:06 06:57-07:23/26	05:25 05:54-06:21/27 21:01	04:45 20:14-21:12/58 21:46
11	08:31 16:15	07:47 17:14	06:45 18:09	06:28 18:54-19:31/37 20:07 06:56-07:21/25	05:23 05:52-06:20/28 21:03	04:44 20:14-21:13/59 21:46
12	08:31 16:17	07:45 17:16	06:42 18:11	06:26 18:54-19:32/38 20:09 06:57-07:19/22	05:21 05:51-06:18/27 21:05	04:44 20:15-21:14/59 21:47
13	08:30 16:18	07:43 17:18	06:40 18:13	06:24 18:54-19:32/38 20:11 06:58-07:17/19	05:19 05:50-06:16/26 21:06	04:44 20:14-21:14/60 21:48
14	08:29 16:20	07:41 17:20	06:37 18:15	06:21 18:53-19:31/38 20:13 06:58-07:15/17	05:17 05:50-06:15/25 21:08	04:43 20:15-21:15/60 21:49
15	08:28 16:22	07:39 17:22	06:35 18:17	06:19 18:53-19:31/38 20:15 07:00-07:13/13	05:16 20:30-20:36/6 21:10 05:51-06:14/23	04:43 20:15-21:15/60 21:49 05:18-05:19/1
16	08:27 16:23	07:37 17:24	06:32 18:19	06:17 18:53-19:30/37 20:17 07:03-07:10/7	05:14 20:25-20:39/14 21:12 05:52-06:12/20	04:43 20:15-21:16/61 21:50 05:18-05:19/1
17	08:26 16:25	07:35 17:26	06:30 18:21	06:14 18:53-19:29/36 20:19	05:12 20:23-20:42/19 21:13 05:53-06:11/18	04:43 20:16-21:16/60 21:50 05:18-05:20/2
18	08:25 16:27	07:33 17:28	06:27 18:22	06:12 18:54-19:28/34 20:21	05:11 20:21-20:43/22 21:15 05:53-06:09/16	04:43 20:16-21:16/60 21:51 05:18-05:20/2
19	08:24 16:29	07:31 17:30	06:25 18:24	06:09 18:54-19:28/34 20:22	05:09 20:20-20:45/25 21:17 05:55-06:08/13	04:43 20:16-21:17/61 21:51 05:18-05:20/2
20	08:23 16:30	07:29 17:32	06:22 18:26	06:07 18:55-19:27/32 20:24	05:07 20:18-20:46/28 21:18 05:56-06:06/10	04:43 20:16-21:17/61 21:52 05:18-05:20/2
21	08:22 16:32	07:26 17:34	06:20 18:28	06:05 18:55-19:25/30 20:26	05:06 20:18-20:47/29 21:20 05:59-06:04/5	04:43 20:16-21:17/61 21:52 05:18-05:21/3
22	08:21 16:34	07:24 17:36	06:18 18:30	06:03 18:56-19:24/28 20:28	05:04 20:17-20:48/31 21:21	04:43 20:16-21:17/61 21:52 05:18-05:21/3
23	08:19 16:36	07:22 17:38	06:15 18:32	06:00 18:58-19:22/24 20:30	05:03 20:16-20:48/32 21:23	04:43 20:16-21:17/61 21:52 05:19-05:22/3
24	08:18 16:38	07:20 17:40	06:13 18:34	05:58 19:00-19:20/20 20:32	05:02 20:15-20:49/34 21:24	04:43 20:17-21:18/61 21:53 05:19-05:21/2
25	08:17 16:40	07:18 17:42	06:10 18:36	05:56 19:02-19:18/16 20:34	05:00 20:15-20:50/35 21:26	04:44 20:17-21:18/61 21:53 05:19-05:21/2
26	08:15 16:42	07:15 17:44	06:08 06:33-06:38/5 18:38	05:54 19:06-19:14/8 20:35 06:21-06:23/2	04:59 20:15-20:51/36 21:27	04:44 20:18-21:18/60 21:53 05:20-05:22/2
27	08:14 16:44	07:13 17:46	06:05 06:31-06:39/8 18:39	05:51 06:19-06:24/5 20:37	04:58 20:15-20:52/37 21:29	04:44 20:18-21:18/60 21:53 05:20-05:22/2
28	08:12 16:45	07:11 17:48	06:03 06:28-06:39/11 18:41	05:49 06:17-06:25/8 20:39	04:56 20:14-20:52/38 21:30	04:45 20:17-21:18/61 21:53 05:21-05:22/1
29	08:11 16:47		06:00 06:26-06:40/14 18:43	05:47 06:15-06:25/10 20:41	04:55 20:14-20:53/39 21:32	04:45 20:18-21:18/60 21:52
30	08:09 16:49		05:58 06:23-06:39/16 18:45	05:45 06:13-06:26/13 20:43	04:54 20:14-20:53/39 21:33	04:46 20:19-21:18/59 21:52
31	08:07 16:51		06:55 07:21-07:40/19 19:47		04:53 20:55-21:02/7 21:34 20:14-20:53/39	
Sonnenscheinstunden	248	271	365	419	494	511
Anzahl Minuten mit Schatten	0	0	73	1173	942	1775

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kessdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 10 - WEA 10

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober	November	Dezember
1	04:47 20:18-21:18/60 21:52	05:26 06:01-06:26/25 21:17	06:21 18:53-19:31/38 20:11 06:56-07:17/21	07:15 18:56 16:45	07:13 16:45 15:59	08:09 15:59 08:11
2	04:47 20:19-21:18/59 21:52	05:28 06:01-06:28/27 21:15	06:23 18:53-19:30/37 20:08 06:55-07:19/24	07:16 18:54 16:43	07:15 16:43 15:58	08:11 15:58 08:12
3	04:48 20:19-21:18/59 21:51	05:30 06:02-06:30/28 21:14	06:24 18:53-19:30/37 20:06 06:55-07:21/26	07:18 18:51 16:41	07:17 16:41 15:58	08:12 15:58 08:14
4	04:49 20:19-21:16/57 21:51	05:31 06:04-06:31/27 21:12	06:26 18:52-19:29/37 20:03 06:56-07:22/26	07:20 18:49 16:39	07:19 16:39 15:57	08:14 15:57 08:15
5	04:50 20:19-21:16/57 21:50	05:33 06:06-06:33/27 21:10	06:28 18:52-19:28/36 20:01 06:57-07:22/25	07:22 18:46 16:37	07:21 16:37 15:56	08:15 15:56 08:17
6	04:51 20:20-21:16/56 21:50	05:35 06:07-06:33/26 21:08	06:30 18:53-19:28/35 19:58 06:59-07:27/28	07:24 18:44 16:35	07:23 16:35 15:56	08:17 15:56 08:18
7	04:52 20:20-21:15/55 21:49	05:36 06:09-06:34/25 21:06	06:32 18:54-19:27/33 19:56 07:01-07:29/28	07:26 18:42 16:33	07:25 16:33 15:55	08:18 15:55 08:19
8	04:52 20:20-21:15/55 21:48	05:38 06:10-06:34/24 21:04	06:33 18:54-19:25/31 19:54 07:02-07:30/28	07:27 18:39 16:31	07:27 16:31 15:55	08:19 15:55 08:21
9	04:54 20:21-21:14/53 21:48	05:40 06:12-06:34/22 21:02	06:35 18:55-19:23/28 19:51 07:04-07:31/27	07:29 18:37 16:29	07:29 16:29 15:54	08:21 15:54 08:22
10	04:55 20:21-21:14/53 21:47	05:42 06:14-06:35/21 21:00	06:37 18:56-19:22/26 19:49 07:06-07:31/25	07:31 18:34 16:28	07:31 16:28 15:54	08:22 15:54 08:23
11	04:56 20:21-21:13/52 21:46	05:43 06:15-06:34/19 20:58	06:39 18:57-19:19/22 19:46 07:08-07:32/24	07:33 18:32 16:26	07:33 16:26 15:53	08:23 15:53 08:24
12	04:57 20:21-21:12/51 21:45	05:45 06:17-06:34/17 20:56	06:41 18:59-19:16/17 19:44 07:09-07:31/22	07:35 18:30 16:24	07:35 16:24 15:53	08:24 15:53 08:25
13	04:58 20:22-21:11/49 21:44	05:47 06:19-06:34/15 20:54	06:42 19:03-19:12/9 19:41 07:11-07:31/20	07:37 18:27 16:22	07:37 16:22 15:53	08:25 15:53 08:26
14	04:59 21:03-21:10/7 21:43	05:49 06:20-06:33/13 20:52	06:44 07:13-07:31/18 19:39	07:39 18:25 16:21	07:39 16:21 15:53	08:26 15:53 08:27
15	05:01 20:22-21:01/39 21:42	05:50 06:22-06:33/11 20:50	06:46 07:15-07:31/16 19:36	07:41 18:22 16:19	07:41 16:19 15:53	08:27 15:53 08:28
16	05:02 20:23-21:02/39 21:41	05:52 06:23-06:31/8 20:47	06:48 07:16-07:29/13 19:34	07:42 18:20 16:18	07:42 16:18 15:53	08:28 15:53 08:29
17	05:03 20:23-21:01/38 21:40	05:54 06:25-06:31/6 20:45	06:49 07:18-07:28/10 19:31	07:44 18:18 16:16	07:44 16:16 15:53	08:29 15:53 08:30
18	05:05 20:24-21:01/37 21:38	05:56 19:16-19:17/1 20:43	06:51 07:20-07:27/7 19:29	07:46 18:15 16:14	07:46 16:14 15:53	08:30 15:53 08:31
19	05:06 20:24-21:00/36 21:37	05:58 19:09-19:23/14 20:41	06:53 07:22-07:25/3 19:26	07:48 18:13 16:13	07:48 16:13 15:53	08:31 15:53 08:31
20	05:07 20:25-21:00/35 21:36	05:59 19:06-19:25/19 20:39	06:55 19:24 19:24	07:50 18:11 16:12	07:50 16:12 15:54	08:31 15:54 08:32
21	05:09 20:25-20:59/34 21:35	06:01 19:04-19:27/23 20:36	06:57 19:21 19:21	07:52 18:09 16:10	07:52 16:10 15:54	08:32 15:54 08:33
22	05:10 20:26-20:58/32 21:33	06:03 19:02-19:28/26 20:34	06:58 19:19 19:19	07:54 18:06 16:09	07:54 16:09 15:54	08:33 15:54 08:33
23	05:12 20:27-20:58/31 21:32	06:05 19:00-19:29/29 20:32	07:00 19:16 19:16	07:56 18:04 16:08	07:56 16:08 15:55	08:33 15:55 08:34
24	05:13 20:28-20:57/29 21:30	06:07 18:59-19:30/31 20:29	07:02 19:14 19:14	07:58 18:02 16:06	07:58 16:06 15:56	08:34 15:56 08:34
25	05:15 20:29-20:57/28 21:29	06:08 18:57-19:30/33 20:27	07:04 19:11 19:11	08:00 18:00 16:05	07:59 16:05 15:56	08:34 15:56 08:35
26	05:16 20:30-20:55/25 21:27	06:10 18:57-19:31/34 20:25	07:06 19:09 19:09	08:02 17:57 16:04	08:01 16:04 15:57	08:35 15:57 08:35
27	05:18 20:31-20:53/22 21:26	06:12 18:56-19:31/35 20:22	07:07 19:06 19:06	08:04 16:55 16:03	08:02 16:03 15:58	08:35 15:58 08:35
28	05:20 20:33-20:52/19 21:24	06:14 18:55-19:32/37 20:20	07:09 19:04 19:04	08:06 16:51 16:01	08:04 16:01 15:59	08:35 15:59 08:35
29	05:21 20:35-20:49/14 21:22	06:16 18:54-19:31/37 20:18	07:11 19:01 19:01	08:07 16:51 16:01	08:06 16:01 15:59	08:35 15:59 08:35
30	05:23 20:39-20:46/7 21:21	06:17 18:54-19:32/38 20:15	07:13 18:59 18:59	08:09 16:49 16:00	08:07 16:00 16:00	08:35 16:00 08:35
31	05:24 06:01-06:26/25 21:19	06:19 18:54-19:32/38 20:13	06:59 18:58-07:17/19 06:58	07:11 16:47 16:47	07:11 16:47 16:01	08:35 16:01 16:01
Sonnenscheinstunden	514	462	384	777	330	259
Anzahl Minuten mit Schatten	1356	785	777	0	0	0

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

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 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 11 - WEA 11

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 16:02	08:06 16:53	07:08 16:49-17:20/31 17:50 07:35-07:52/17	06:53 18:31-19:15/44 19:49 07:18-07:33/15	05:43 19:18-19:32/14 18:30-19:04/34 20:45 19:41-20:13/32 06:11-06:17/6	04:52 19:35-20:22/47 21:36 05:51-06:20/29
2	08:35 16:03	08:04 16:55	07:06 16:49-17:20/31 17:52 07:33-07:52/19	06:50 18:30-19:16/46 19:51 07:16-07:34/18	05:41 19:22-19:27/5 18:33-19:03/30 20:47 19:41-20:15/34 06:09-06:19/10	04:51 19:35-20:22/47 21:37 05:52-06:19/27
3	08:35 16:05	08:02 16:57	07:04 16:48-17:19/31 17:54 07:30-07:52/22	06:48 18:28-19:16/48 19:53 07:14-07:34/20	05:39 19:39-20:16/37 06:07-06:20/13 20:48 18:35-19:00/25	04:50 19:36-20:21/45 21:38 05:52-06:18/26
4	08:35 16:06	08:01 16:59	07:01 16:48-17:20/32 17:56 07:28-07:52/24	06:45 18:27-19:17/50 19:54 07:11-07:33/22	05:37 19:38-20:17/39 06:05-06:21/16 20:50 18:38-18:57/19	04:49 19:37-20:22/45 21:39 05:53-06:18/25
5	08:34 16:07	07:59 17:01	06:59 16:48-17:19/31 17:58 07:25-07:50/25	06:43 18:27-19:18/51 19:56 07:09-07:33/24	05:35 19:37-20:18/41 06:03-06:22/19 20:52 18:42-18:53/11	04:48 19:37-20:21/44 21:40 05:54-06:17/23
6	08:34 16:08	07:57 17:03	06:57 16:48-17:18/30 17:59 07:23-07:50/27	06:41 18:25-19:18/53 19:58 07:06-07:32/26	05:33 19:36-20:19/43 20:54 06:01-06:23/22	04:48 19:37-20:21/44 21:42 05:54-06:16/22
7	08:34 16:10	07:55 17:05	06:54 16:48-17:17/29 18:01 07:21-07:49/28	06:38 18:24-19:19/55 20:00 07:04-07:32/28	05:31 19:35-20:19/44 20:56 05:59-06:23/24	04:47 19:38-20:22/44 21:43 05:56-06:17/21
8	08:33 16:11	07:53 17:07	06:52 16:49-17:16/27 18:03 07:18-07:47/29	06:36 19:23-19:36/13 07:01-07:30/29 20:02 18:23-19:19/56	05:29 19:34-20:20/46 20:58 05:57-06:24/27	04:46 19:38-20:21/43 21:44 05:56-06:16/20
9	08:33 16:12	07:51 17:10	06:49 16:50-17:14/24 18:05 07:16-07:46/30	06:33 19:20-19:38/18 06:59-07:29/30 20:04 18:23-19:19/56	05:27 19:34-20:21/47 20:59 05:56-06:25/29	04:46 19:39-20:21/42 21:45 05:57-06:16/19
10	08:32 16:14	07:49 17:12	06:47 16:52-17:13/21 18:07 07:13-07:42/29	06:31 18:22-19:40/78 20:06 06:57-07:28/31	05:25 19:33-20:21/48 21:01 05:54-06:25/31	04:45 19:39-20:21/42 21:45 05:57-06:15/18
11	08:31 16:15	07:47 17:14	06:45 16:54-17:12/18 18:09 07:11-07:37/26	06:28 18:21-19:41/80 20:07 06:54-07:26/32	05:23 19:32-20:21/48 21:03 05:53-06:25/33	04:44 19:40-20:21/41 21:46 05:59-06:14/15
12	08:31 16:17	07:45 17:16	06:42 16:56-17:08/12 18:11 07:08-07:36/28	06:26 18:21-19:43/82 20:09 06:52-07:24/32	05:21 19:32-20:21/49 21:05 05:51-06:26/35	04:44 19:41-20:21/40 21:47 06:00-06:14/14
13	08:30 16:19	07:43 17:18	06:40 07:09-07:35/26 18:13	06:24 18:21-19:44/83 20:11 06:52-07:22/30	05:19 19:32-20:22/50 21:06 05:49-06:26/37	04:44 19:40-20:21/41 21:48 06:00-06:13/13
14	08:29 16:20	07:41 17:20	06:37 07:08-07:32/24 18:15	06:21 18:20-19:44/84 20:13 06:52-07:20/28	05:17 19:32-20:22/50 21:08 05:47-06:25/38	04:43 19:41-20:21/40 21:49 06:01-06:13/12
15	08:28 16:22	07:39 17:22	06:35 07:10-07:30/20 18:17	06:19 18:20-19:45/85 20:15 06:53-07:18/25	05:16 19:32-20:23/51 21:10 05:46-06:26/40	04:43 19:41-20:21/40 21:49 06:02-06:13/11
16	08:27 16:23	07:37 17:24	06:32 07:10-07:28/18 18:19	06:17 18:21-19:45/84 20:17 06:54-07:15/21	05:14 19:31-20:22/51 21:12 05:45-06:25/40	04:43 19:42-20:21/39 21:50 06:03-06:12/9
17	08:26 16:25	07:35 17:26	06:30 07:12-07:26/14 18:21	06:14 18:20-19:45/85 20:19 06:54-07:13/19	05:12 19:32-20:23/51 21:13 05:46-06:26/40	04:43 19:42-20:21/39 21:50 06:04-06:12/8
18	08:25 16:27	07:33 17:28	06:27 07:15-07:22/7 18:22	06:12 18:20-19:45/85 20:21 06:55-07:11/16	05:11 19:31-20:22/51 21:15 05:45-06:25/40	04:43 19:43-20:22/39 21:51 06:05-06:11/6
19	08:24 16:29	07:31 17:30	06:25 18:24 20:22	06:10 18:21-19:45/84 20:22 06:58-07:09/11	05:09 19:32-20:23/51 21:17 05:46-06:25/39	04:43 19:43-20:22/39 21:51 06:06-06:11/5
20	08:23 16:30	07:29 17:32	06:22 18:26 20:24	06:07 18:21-19:45/84 20:24	05:08 19:31-20:22/51 21:18 05:45-06:25/40	04:43 19:43-20:22/39 21:52 06:07-06:10/3
21	08:22 16:32	07:26 17:34	06:20 18:28 20:26	06:05 18:21-19:44/83 20:26	05:06 19:32-20:23/51 21:20 05:46-06:25/39	04:43 19:43-20:22/39 21:52 06:07-06:10/3
22	08:21 16:34	07:24 17:36	06:18 17:52-18:04/12 18:30	06:03 18:21-19:43/82 20:28	05:04 19:32-20:23/51 21:21 05:47-06:25/38	04:43 19:43-20:22/39 21:52 06:07-06:10/3
23	08:19 16:36	07:22 17:38	06:15 17:49-18:08/19 18:32	06:00 18:22-19:43/81 20:30	05:03 19:32-20:22/50 21:23 05:46-06:24/38	04:43 19:44-20:23/39 21:52 06:08-06:11/3
24	08:18 16:38	07:20 17:40	06:13 17:46-18:09/23 18:34	05:58 18:23-19:42/79 20:32	05:02 19:32-20:22/50 21:24 05:47-06:24/37	04:43 19:44-20:23/39 21:53 06:08-06:11/3
25	08:17 16:40	07:18 17:42	06:10 17:44-18:11/27 18:36	05:56 18:24-19:42/78 20:34	05:00 19:33-20:22/49 21:26 05:47-06:23/36	04:44 19:44-20:23/39 21:53 06:07-06:12/5
26	08:15 16:42	07:15 17:44	06:08 17:42-18:12/30 18:38	05:54 18:25-19:41/76 20:35	04:59 19:33-20:23/50 21:27 05:48-06:23/35	04:44 19:45-20:24/39 21:53 06:07-06:13/6
27	08:14 16:44	07:13 17:46	06:05 17:41-18:13/32 18:39	05:51 19:12-19:40/28 18:26-19:10/44 20:37 19:55-20:03/8	04:58 19:33-20:23/50 21:29 05:48-06:23/35	04:44 19:44-20:23/39 21:53 06:06-06:14/8
28	08:12 16:45	07:11 17:48	06:03 17:39-18:13/34 18:41 06:28-06:29/1	05:49 19:13-19:39/26 18:27-19:09/42 20:39 19:50-20:08/18	04:56 19:34-20:23/49 21:30 05:49-06:22/33	04:45 19:44-20:23/39 21:52 06:06-06:15/9
29	08:11 16:47	07:10 17:48	06:00 17:38-18:14/36 18:43 06:26-06:31/5	05:47 19:14-19:36/22 18:27-19:07/40 20:41 19:46-20:09/23	04:55 19:34-20:22/48 21:32 05:50-06:22/32	04:45 19:44-20:23/39 21:52 06:05-06:16/11
30	08:09 16:49		05:58 17:35-18:14/39 18:45 06:23-06:32/9	05:45 19:15-19:34/19 18:28-19:05/37 20:43 19:43-20:11/28 06:13-06:14/1	04:54 19:35-20:22/47 21:33 05:50-06:21/31	04:46 19:45-20:25/40 21:52 06:05-06:17/12
31	08:07 16:51		06:55 18:34-19:15/41 19:47 07:21-07:33/12		04:53 19:35-20:22/47 21:34 05:51-06:21/30	
Sonnenscheinstunden	248	271	365	419	494	511
Anzahl Minuten mit Schatten	0	209	1050	2676	2557	1621

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten

Projekt: 19-095-GBK-02	Beschreibung: Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kesdorf	Lizenzierter Anwender: T&H Ingenieure GmbH Bremerhavener Heerstraße 10 DE-28717 Bremen +49 (0) 421 79 400 600 info@th-ingenieure.de Berechnet: 20.08.2019 10:57/3.2.744
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SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 11 - WEA 11

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2019
Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:
Die Sonne scheint täglich von Sonnenauf- bis -untergang
Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober	November	Dezember
1	04:47 19:44-20:25/41 21:52 06:04-06:17/13	05:26 19:42-20:32/50 21:17 05:59-06:36/37	06:21 18:20-19:43/83 20:11 06:51-07:22/31	07:15 07:48-08:12/24 18:56	07:13 16:45 16:45 15:59	08:09 15:59
2	04:47 19:45-20:25/40 21:51 06:04-06:18/14	05:28 19:43-20:32/49 21:15 06:01-06:36/35	06:23 18:20-19:41/81 20:08 06:52-07:24/32	07:16 07:47-08:13/26 18:54	07:15 16:43 16:43 15:58	08:11 15:58
3	04:48 19:45-20:26/41 21:51 06:04-06:19/15	05:30 19:43-20:31/48 21:14 06:02-06:35/33	06:24 18:20-19:39/79 20:06 06:54-07:26/32	07:18 17:34-17:47/13 18:51 07:47-08:14/27	07:17 16:41 16:41 15:58	08:12 15:58
4	04:49 19:44-20:26/42 21:51 06:03-06:21/18	05:31 19:43-20:31/48 21:12 06:04-06:35/31	06:26 18:20-19:36/76 20:03 06:56-07:27/31	07:20 17:31-17:50/19 18:49 07:49-08:15/26	07:19 16:39 16:39 15:57	08:14 15:57
5	04:50 19:44-20:26/42 21:50 06:02-06:21/19	05:33 19:43-20:30/47 21:10 06:05-06:34/29	06:28 19:18-19:34/16 06:57-07:27/30 20:01 18:20-19:16/56	07:22 17:28-17:50/22 18:46 07:51-08:20/29	07:21 16:37 16:37 15:56	08:15 15:56
6	04:51 19:44-20:27/43 21:50 06:02-06:22/20	05:35 19:44-20:30/46 21:08 06:07-06:34/27	06:30 19:21-19:32/11 06:59-07:28/29 19:58 18:20-19:15/55	07:24 17:27-17:51/24 18:44 07:52-08:22/30	07:23 16:35 16:35 15:56	08:17 15:56
7	04:52 19:44-20:27/43 21:49 06:01-06:23/22	05:36 19:45-20:29/44 21:06 06:09-06:34/25	06:32 18:21-19:15/54 19:56 07:01-07:28/27	07:26 17:25-17:52/27 18:42 07:54-08:23/29	07:25 16:33 16:33 15:55	08:18 15:55
8	04:53 19:44-20:28/44 21:48 06:01-06:23/22	05:38 19:45-20:28/43 21:04 06:10-06:32/22	06:33 18:20-19:13/53 19:54 07:02-07:27/25	07:27 17:24-17:53/29 18:39 07:56-08:24/28	07:27 16:31 16:31 15:55	08:19 15:55
9	04:54 19:44-20:28/44 21:47 06:01-06:24/23	05:40 19:46-20:28/42 06:12-06:32/20 21:02 18:52-19:01/9	06:35 18:21-19:12/51 19:51 07:04-07:27/23	07:29 17:23-17:53/30 18:37 07:58-08:25/27	07:29 16:29 16:29 15:54	08:21 15:54
10	04:55 19:44-20:29/45 21:47 06:00-06:25/25	05:42 19:46-20:26/40 06:14-06:31/17 21:00 18:47-19:05/18	06:37 18:22-19:11/49 19:49 07:06-07:27/21	07:31 17:23-17:54/31 18:34 08:00-08:25/25	07:31 16:28 16:28 15:54	08:22 15:54
11	04:56 19:44-20:29/45 21:46 06:00-06:26/26	05:43 19:47-20:25/38 06:15-06:29/14 20:58 18:44-19:08/24	06:39 18:22-19:09/47 19:46 07:08-07:27/19	07:33 17:22-17:54/32 18:32 08:02-08:26/24	07:33 16:26 16:26 15:54	08:23 15:54
12	04:57 19:43-20:30/47 21:45 05:59-06:27/28	05:45 19:33-19:34/1 18:42-19:11/29 20:56 19:49-20:24/35 06:17-06:28/11	06:41 18:23-19:08/45 19:44 07:09-07:25/16	07:35 17:22-17:54/32 18:30 08:04-08:26/22	07:35 16:24 16:24 15:53	08:24 15:53
13	04:58 19:43-20:30/47 21:44 05:59-06:28/29	05:47 19:27-19:39/12 18:39-19:12/33 20:54 19:49-20:22/33 06:18-06:25/7	06:42 18:24-19:06/42 19:41 07:11-07:25/14	07:37 17:22-17:53/31 18:27 08:06-08:25/19	07:37 16:23 16:23 15:53	08:25 15:53
14	04:59 19:43-20:30/47 21:43 05:58-06:29/31	05:49 19:24-19:42/18 18:37-19:13/36 20:52 19:51-20:20/29 06:20-06:22/2	06:44 18:26-19:06/40 19:39 07:13-07:24/11	07:39 17:22-17:53/31 18:25 08:08-08:25/17	07:39 16:21 16:21 15:53	08:26 15:53
15	05:01 19:43-20:30/47 21:42 05:59-06:30/31	05:50 19:22-19:44/22 18:36-19:15/39 20:50 19:53-20:18/25	06:46 18:26-19:04/38 19:36 07:15-07:23/8	07:41 17:22-17:52/30 18:22 08:10-08:25/15	07:41 16:19 16:19 15:53	08:27 15:53
16	05:02 19:43-20:31/48 21:41 05:58-06:31/33	05:52 19:20-19:45/25 18:33-19:15/42 20:47 19:55-20:15/20	06:48 18:28-19:03/35 19:34 07:16-07:20/4	07:42 17:22-17:52/30 18:20 08:12-08:24/12	07:42 16:18 16:18 15:53	08:28 15:53
17	05:03 19:43-20:32/49 21:40 05:58-06:31/33	05:54 19:19-19:46/27 18:32-19:16/44 20:45 19:59-20:11/12	06:49 18:28-19:02/34 19:31	07:44 17:22-17:50/28 18:18 08:14-08:23/9	07:44 16:16 16:16 15:53	08:29 15:53
18	05:05 19:42-20:32/50 21:38 05:57-06:32/35	05:56 18:31-19:47/76 20:43	06:51 18:29-19:01/32 19:29	07:46 17:23-17:48/25 18:15 08:16-08:21/5	07:46 16:15 16:15 15:53	08:30 15:53
19	05:06 19:42-20:32/50 21:37 05:57-06:32/35	05:58 18:29-19:47/78 20:41	06:53 18:29-18:59/30 19:26	07:48 17:24-17:45/21 18:13 08:18-08:20/2	07:48 16:13 16:13 15:53	08:31 15:53
20	05:07 19:43-20:32/49 21:36 05:57-06:33/36	05:59 18:29-19:48/79 20:39	06:55 18:31-18:57/26 19:24	07:50 17:25-17:43/18 18:11	07:50 16:12 16:12 15:54	08:31 15:54
21	05:09 19:42-20:32/50 21:35 05:57-06:34/37	06:01 18:28-19:48/80 20:36	06:57 18:33-18:55/22 19:21	07:52 17:27-17:41/14 18:09	07:52 16:10 16:10 15:54	08:32 15:54
22	05:10 19:42-20:32/50 21:33 05:56-06:34/38	06:03 18:26-19:48/82 20:34	06:58 18:35-18:52/17 19:19	07:54 17:29-17:38/9 18:06	07:54 16:09 16:09 15:55	08:33 15:55
23	05:12 19:42-20:33/51 21:32 05:57-06:35/38	06:05 18:26-19:48/82 20:32	07:00 18:38-18:47/9 19:16	07:56 17:33-17:36/3 18:04	07:56 16:08 16:08 15:55	08:33 15:55
24	05:13 19:42-20:33/51 21:30 05:56-06:35/39	06:07 18:25-19:48/83 20:29	07:02 19:14 19:14	07:58 18:02 18:02	07:57 16:06 16:06 15:56	08:34 15:56
25	05:15 19:42-20:33/51 21:29 05:57-06:36/39	06:08 18:24-19:48/84 20:27 07:03-07:11/8	07:04 19:11 19:11	08:00 18:00 18:00	07:59 16:05 16:05 15:56	08:34 15:56
26	05:16 19:42-20:33/51 21:27 05:56-06:35/39	06:10 18:23-19:48/85 20:25 06:59-07:13/14	07:06 19:09 19:09	08:02 17:58 17:58	08:01 16:04 16:04 15:57	08:34 15:57
27	05:18 19:42-20:33/51 21:26 05:56-06:36/40	06:12 18:23-19:47/84 20:22 06:57-07:15/18	07:07 07:57-08:05/8 19:06	07:04 16:55 16:55	08:02 16:03 16:03 15:58	08:35 15:58
28	05:20 19:42-20:33/51 21:24 05:56-06:36/40	06:14 18:22-19:47/85 20:20 06:56-07:17/21	07:09 07:54-08:08/14 19:04	07:05 16:53 16:53	08:04 16:02 16:02 15:58	08:35 15:58
29	05:21 19:42-20:32/50 21:22 05:57-06:36/39	06:16 18:21-19:46/85 20:18 06:54-07:18/24	07:11 07:51-08:09/18 19:01	07:07 16:51 16:51	08:06 16:01 16:01 15:59	08:35 15:59
30	05:23 19:42-20:33/51 21:21 05:56-06:36/40	06:17 18:21-19:45/84 20:15 06:53-07:20/27	07:13 07:49-08:10/21 18:59	07:09 16:49 16:49	08:07 16:00 16:00 15:59	08:35 15:59
31	05:24 19:43-20:33/50 21:19 05:58-06:36/38	06:19 18:21-19:45/84 20:13 06:52-07:22/30	18:59 18:59	07:11 16:47 16:47	08:35 16:01 16:01 15:59	08:35 15:59
Sonnenscheinstunden	514	462	384	330	259	232
Anzahl Minuten mit Schatten	2396	2631	1495	895	0	0

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten

Projekt: 19-095-GBK-02	Beschreibung: Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kesdorf	Lizenzierter Anwender: T&H Ingenieure GmbH Bremerhavener Heerstraße 10 DE-28717 Bremen +49 (0) 421 79 400 600 info@th-ingenieure.de Berechnet: 20.08.2019 10:57/3.2.744
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SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 12 - WEA 12

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender **2019**
Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:
Die Sonne scheint täglich von Sonnenauf- bis -untergang
Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 16:02	08:06 08:36-09:01/25 16:53	07:08 16:32-17:22/50 17:50 07:35-07:49/14	06:53 18:23-18:47/24 19:49 07:18-07:59/41	05:43 07:10-07:37/27 20:45	04:52 21:36
2	08:35 16:03	08:04 08:35-09:02/27 16:55	07:06 16:32-17:23/51 17:52 07:33-07:50/17	06:50 18:25-18:45/20 19:51 07:16-08:00/44	05:41 07:18-07:33/15 20:47	04:51 21:37
3	08:35 16:05	08:02 08:33-09:02/29 16:57	07:04 16:32-17:22/50 17:54 07:30-07:50/20	06:48 18:27-18:41/14 19:53 07:14-08:01/47	05:39 20:48	04:50 21:38
4	08:35 16:06	08:01 16:27-16:30/3 16:59 08:31-09:02/31	07:01 16:32-17:22/50 17:56 07:28-07:51/23	06:45 07:11-08:01/50 19:54	05:37 20:50	04:49 21:39
5	08:34 16:07	07:59 16:25-16:33/8 17:01 08:29-09:02/33	06:59 16:32-17:21/49 17:58 07:25-07:51/26	06:43 07:09-08:02/53 19:56	05:35 20:52	04:48 21:40
6	08:34 16:08	07:57 16:24-16:35/11 17:03 08:27-09:01/34	06:57 16:33-17:21/48 17:59 07:23-07:52/29	06:41 07:06-08:01/55 19:58	05:33 20:54	04:48 21:42
7	08:34 16:10	07:55 16:23-16:37/14 17:05 08:25-09:00/35	06:54 16:33-17:20/47 18:01 07:21-07:52/31	06:38 07:04-08:02/58 20:00	05:31 20:56	04:47 21:43
8	08:33 16:11	07:53 16:22-16:38/16 17:08 08:23-08:59/36	06:52 17:37-17:38/1 07:18-07:51/33 18:03 16:35-17:19/44	06:36 07:01-08:01/60 20:02	05:29 20:58	04:46 21:44
9	08:33 16:12	07:51 16:22-16:41/19 17:10 08:21-08:58/37	06:49 17:31-17:40/9 07:16-07:51/35 18:05 16:36-17:17/41	06:33 07:00-08:02/62 20:04	05:27 20:59	04:46 21:45
10	08:32 16:14	07:49 16:21-16:43/22 17:12 08:19-08:55/36	06:47 17:29-17:42/13 07:13-07:50/37 18:07 16:38-17:16/38	06:31 06:59-08:02/63 20:06	05:25 21:01	04:45 21:45
11	08:31 16:15	07:47 16:21-16:45/24 17:14 08:19-08:52/33	06:45 17:28-17:45/17 17:00-17:14/14 18:09 16:41-16:57/16 07:11-07:50/39	06:28 06:58-08:01/63 20:07	05:23 21:03	04:45 21:46
12	08:31 16:17	07:45 16:22-16:45/23 17:16 08:20-08:48/28	06:42 17:26-17:46/20 17:03-17:09/6 18:11 16:45-16:51/6 07:08-07:48/40	06:26 06:58-08:01/63 20:09	05:21 21:05	04:44 21:47
13	08:30 16:19	07:43 16:22-16:45/23 17:18 08:21-08:47/26	06:40 17:25-17:49/24 18:13 07:06-07:48/42	06:24 06:57-08:01/64 20:11	05:19 21:06	04:44 21:48
14	08:29 16:20	07:41 16:22-16:45/23 17:20 08:22-08:46/24	06:37 17:24-17:50/26 18:15 07:04-07:46/42	06:21 06:56-08:00/64 20:13	05:17 21:08	04:43 21:49
15	08:28 16:22	07:39 16:22-16:44/22 17:22 08:23-08:45/22	06:35 17:24-17:52/28 18:17 07:05-07:44/39	06:19 06:56-07:59/63 20:15	05:16 21:10	04:43 21:49
16	08:27 16:23	07:37 16:46-16:56/10 08:23-08:43/20 17:24 16:23-16:43/20	06:32 17:23-17:54/31 18:19 07:04-07:42/38	06:17 06:56-07:59/63 20:17	05:14 21:12	04:43 21:50
17	08:26 16:25	07:35 16:24-16:59/35 17:26 08:25-08:42/17	06:30 17:23-17:55/32 18:21 07:05-07:41/36	06:14 06:56-07:57/61 20:19	05:12 21:13	04:43 21:50
18	08:25 16:27	07:33 16:26-17:01/35 17:28 08:27-08:40/13	06:27 17:22-17:55/33 18:23 07:04-07:38/34	06:12 06:56-07:57/61 20:21	05:11 21:15	04:43 21:51
19	08:24 16:29	07:31 16:28-17:03/35 17:30 08:33-08:35/2	06:25 17:22-17:56/34 18:24 07:05-07:37/32	06:10 06:56-07:56/60 20:22	05:09 21:17	04:43 21:51
20	08:23 16:30	07:29 16:37-17:05/28 17:32	06:22 17:21-17:56/35 18:26 07:05-07:33/28	06:07 06:57-07:55/58 20:24	05:08 21:18	04:43 21:52
21	08:22 16:32	07:26 16:36-17:07/31 17:34	06:20 17:20-17:57/37 18:28 07:07-07:31/24	06:05 06:57-07:54/57 20:26	05:06 21:20	04:43 21:52
22	08:21 08:53-08:55/2 16:34	07:24 16:35-17:10/35 17:36	06:18 17:19-17:56/37 18:30 07:07-07:29/22	06:03 06:57-07:52/55 20:28	05:05 21:21	04:43 21:52
23	08:19 08:52-08:56/4 16:36	07:22 16:34-17:11/37 17:38	06:15 17:19-17:56/37 18:32 07:10-07:27/17	06:00 06:57-07:51/54 20:30	05:03 21:23	04:43 21:52
24	08:18 08:50-08:57/7 16:38	07:20 16:34-17:14/40 17:40	06:13 17:19-17:56/37 18:34 07:12-07:23/11	05:58 06:58-07:50/52 20:32	05:02 21:24	04:43 21:53
25	08:17 08:49-08:59/10 16:40	07:18 16:33-17:16/43 17:42	06:10 17:19-17:56/37 18:36	05:56 06:59-07:48/49 20:34	05:00 21:26	04:44 21:53
26	08:15 08:47-08:59/12 16:42	07:15 16:32-17:18/46 17:44 07:42-07:43/1	06:08 17:19-17:54/35 18:38 06:33-06:47/14	05:54 07:00-07:46/46 20:35	04:59 21:27	04:44 21:53
27	08:14 08:45-09:00/15 16:44	07:13 16:32-17:20/48 17:46 07:40-07:46/6	06:05 17:19-17:54/35 18:39 06:31-06:51/20	05:51 07:01-07:45/44 20:37	04:58 21:29	04:44 21:53
28	08:12 08:44-09:01/17 16:46	07:11 16:31-17:22/51 17:48 07:38-07:48/10	06:03 17:19-17:53/34 18:41 06:28-06:53/25	05:49 07:03-07:43/40 20:39	04:56 21:30	04:45 21:52
29	08:11 08:42-09:01/19 16:47		06:00 17:20-17:52/32 18:43 06:26-06:56/30	05:47 07:04-07:41/37 20:41	04:55 21:32	04:45 21:52
30	08:09 08:40-09:01/21 16:49		05:58 17:20-17:50/30 18:45 06:23-06:57/34	05:45 07:07-07:39/32 20:43	04:54 21:33	04:46 21:52
31	08:07 08:38-09:01/23 16:51		06:55 18:22-18:49/27 19:47 07:21-07:58/37		04:53 21:34	
	Sonnenscheinstunden 248 Anzahl Minuten mit Schatten 130	271 1227	365 2060	419 1677	494 42	511 0

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kesdaorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 20.08.2019 10:57/3.2.744

SHADOW - Kalender pro WEA

Berechnung: Zusatzbelastung WEA: 12 - WEA 12

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober	November	Dezember
1	04:47 21:52	05:26 21:17	06:21 20:11	07:15 18:04-18:29/25	07:13 15:51-16:15/24	08:09 16:45-07:49-08:18/29
2	04:47 21:51	05:28 21:15	06:23 20:08	07:16 18:04-18:27/23	07:15 15:51-16:13/22	08:11 16:43-07:49-08:24/35
3	04:48 21:51	05:30 21:14	06:24 20:06	07:18 18:05-18:25/20 17:41-17:49/8	07:17 15:51-16:11/20	08:12 16:41-07:49-08:26/37
4	04:49 21:51	05:31 21:12	06:26 20:03	07:20 18:06-18:22/16 17:37-17:52/15	07:19 15:51-16:09/18	08:14 16:39-07:52-08:29/37
5	04:50 21:50	05:33 21:10	06:28 20:01	07:22 18:06-18:19/13 07:51-08:28/37	07:21 15:53-16:08/15	08:15 16:37-07:54-08:30/36
6	04:51 21:50	05:35 21:08	06:30 19:58	07:24 18:08-18:17/9 07:52-08:27/35	07:23 15:54-16:05/11	08:17 16:35-07:56-08:31/35
7	04:52 21:49	05:36 21:06	06:32 19:56	07:26 17:11-17:55/44	07:25 15:55-16:03/8	08:18 16:33-07:58-08:31/33
8	04:53 21:48	05:38 21:04	06:33 19:54	07:27 17:09-17:56/47	07:27 15:56-16:01/5	08:19 16:31-08:00-08:32/32
9	04:54 21:47	05:40 21:02	06:35 19:51	07:29 17:08-17:56/48	07:29 15:58-15:59/1	08:21 16:29-08:02-08:32/30
10	04:55 21:47	05:42 21:00	06:37 19:49	07:31 17:07-17:56/49	07:31 08:04-08:32/28	08:22 16:28
11	04:56 21:46	05:43 20:58	06:39 19:46	07:33 17:06-17:56/50	07:33 08:07-08:33/26	08:23 16:26
12	04:57 21:45	05:45 20:56	06:41 19:44	07:35 17:06-17:56/50	07:35 08:09-08:33/24	08:24 16:24
13	04:58 21:44	05:47 20:54	06:42 19:41	07:37 17:05-17:56/51	07:37 08:11-08:33/22	08:25 16:22
14	04:59 21:43	05:49 20:52	06:44 19:39	07:39 17:05-17:56/51	07:39 08:13-08:33/20	08:26 16:21
15	05:01 21:42	05:51 20:50	06:46 19:36	07:41 17:05-17:55/50	07:41 08:15-08:33/18	08:27 16:19
16	05:02 21:41	05:52 20:47	06:48 19:34	07:42 17:04-17:53/49	07:42 08:17-08:33/16	08:28 16:18
17	05:03 21:40	05:54 20:45	06:49 19:31	07:44 17:04-17:50/46	07:44 08:19-08:32/13	08:29 16:16
18	05:05 21:38	05:56 20:43	06:51 19:29	07:46 17:05-17:48/43	07:46 08:21-08:32/11	08:30 16:15
19	05:06 21:37	05:58 20:41	06:53 19:26	07:48 17:05-17:45/40	07:48 08:23-08:31/8	08:31 16:13
20	05:07 21:36	05:59 20:39	06:55 19:24	07:50 17:05-17:43/38	07:50 08:26-08:32/6	08:31 16:12
21	05:09 21:35	06:01 20:36	06:57 19:21	07:52 17:06-17:41/35	07:52 08:28-08:31/3	08:32 16:10
22	05:10 21:33	06:03 20:34	06:58 19:19	07:54 17:06-17:37/31	07:54 16:09	08:33 16:09
23	05:12 21:32	06:05 20:32	07:00 19:16	07:56 17:07-17:36/29	07:56 16:08	08:33 16:08
24	05:13 21:30	06:07 20:29	07:02 19:14	07:58 16:58-17:33/35	07:58 16:06	08:34 16:06
25	05:15 21:29	06:08 20:27	07:04 19:11	08:00 16:56-17:31/35	08:00 16:05	08:34 16:05
26	05:16 21:27	06:10 20:25	07:06 19:09	08:02 16:54-17:29/35	08:02 16:04	08:34 16:04
27	05:18 21:26	06:12 20:22	07:07 19:06	08:04 16:15-16:26/11 07:53-08:12/19	08:04 16:03	08:35 16:03
28	05:20 21:24	06:14 20:20	07:09 19:04	08:06 15:52-16:13/21	08:06 16:02	08:35 16:02
29	05:21 21:22	06:16 20:18	07:11 19:01	08:08 15:52-16:15/23	08:08 16:01	08:35 16:01
30	05:23 21:21	06:17 20:15	07:13 18:59	08:10 15:52-16:15/23	08:10 16:00	08:35 16:00
31	05:25 21:19	06:19 20:13	07:15 18:57	08:12 15:51-16:15/24	08:12 16:00	08:35 16:01
Sonnenscheinstunden	514	462	384	330	259	232
Anzahl Minuten mit Schatten	0	991	1801	1801	623	0

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten

Projekt:

19-095-GBK-02

Beschreibung:

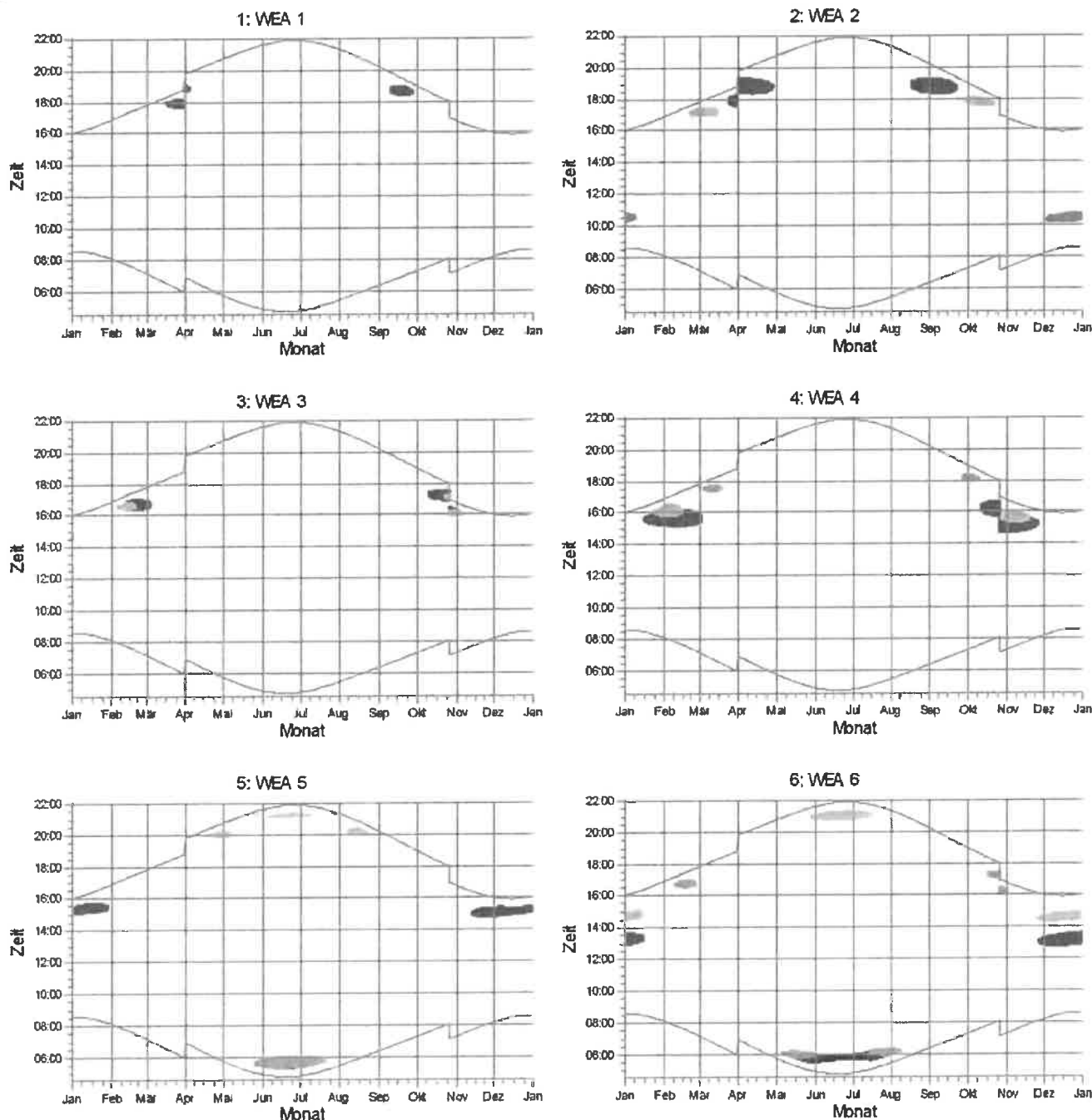
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieranlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

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Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Grafischer Kalender pro WEA

Berechnung: Zusatzbelastung



Schattenrezeptoren

	G: IO 7		I: IO 9		K: IO 11		N: IO 14		R: IO 18
	H: IO 8		J: IO 10		L: IO 12		Q: IO 17		S: IO 19

Projekt:

19-095-GBK-02

Beschreibung:

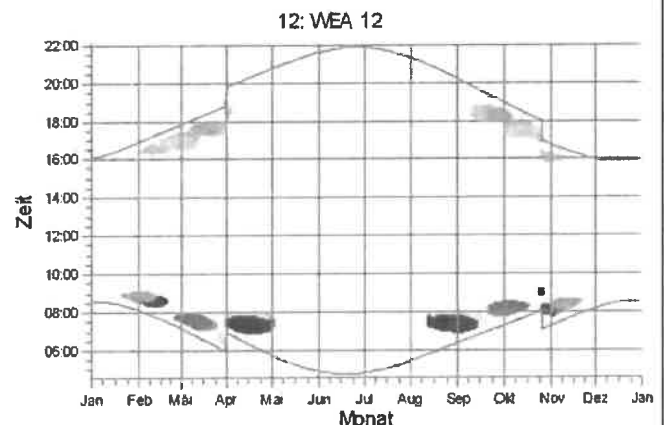
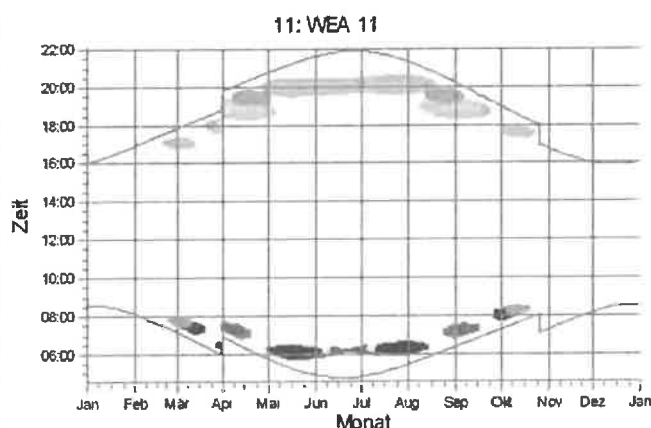
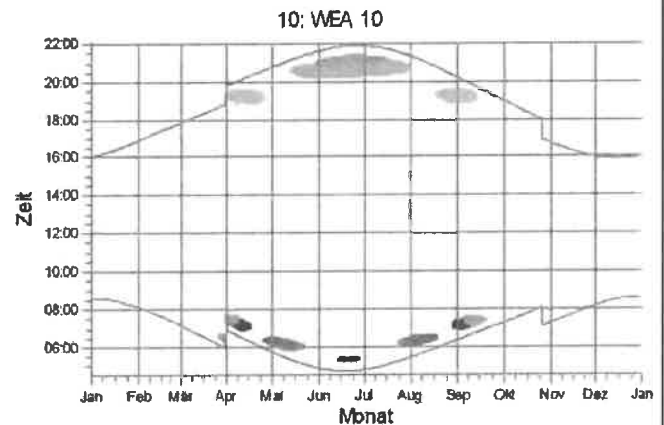
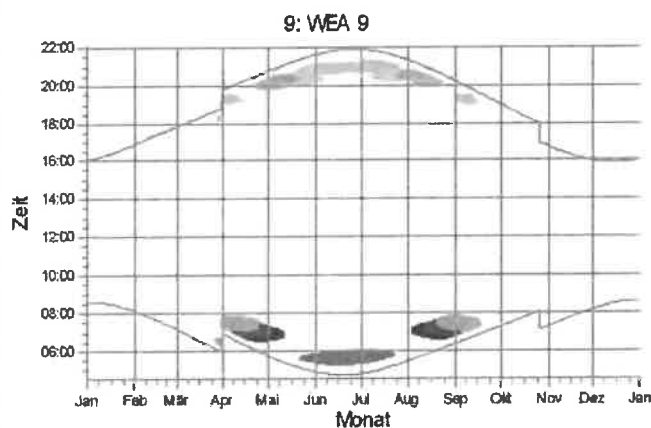
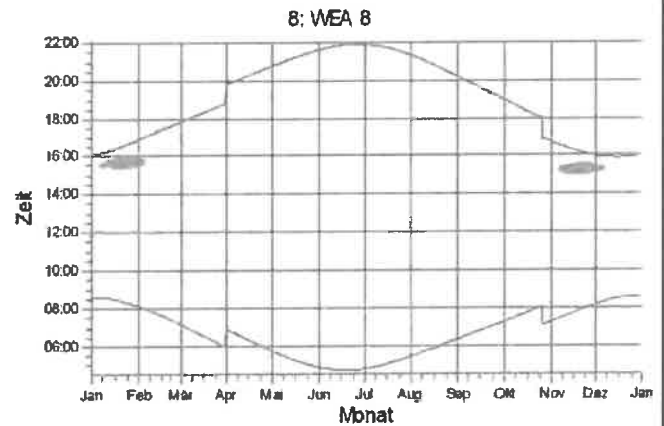
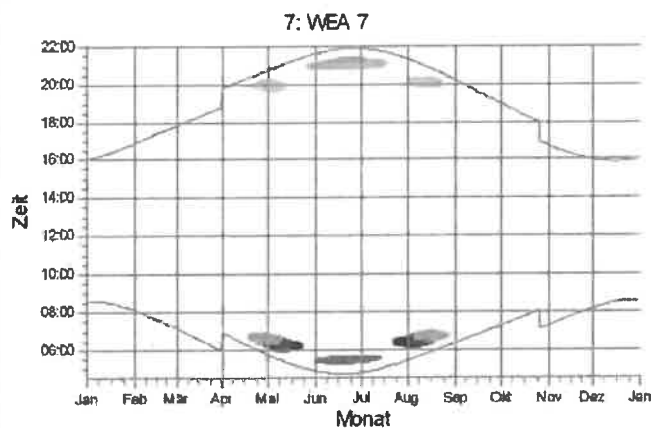
Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
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+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
20.08.2019 10:57/3.2.744

SHADOW - Grafischer Kalender pro WEA

Berechnung: Zusatzbelastung



Schattenrezeptoren

	A: IO 1		D: IO 4		G: IO 7		L: IO 12		O: IO 15
	B: IO 2		E: IO 5		H: IO 8		M: IO 13		P: IO 16
	C: IO 3		F: IO 6		I: IO 9		N: IO 14		S: IO 19



Projekt:
19-095-GBK-02

Beschreibung:
Schattenwurfgutachten für die
Errichtung und den Betrieb neuer
Windenergieanlagen im Rahmen des
Repowering-Vorhabens im Windpark
Kedorf

SHADOW -
Karte
Berechnung:
Zusatzbelastung

Lizenzierter Anwender:
T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnung:
23.08.2019 08:46/3.2.744

▲ Neue WEA

○ Schattenrezeptor

Karte: Lageplan_TK25, Maßstab 1:20.000, Mitte: UTM (north)-ETRS89 Zone: 32 Ost: 607.407 Nord: 5.991.175

Höhe der Schattenkarte: Höhenlinien: CONTOURLINE_ONLINEDATA_0.wpo (1)



Karte: Lageplan_TK25 , Maßstab 1:20.000, Mitte: UTM (north)-ETRS89 Zone: 32 Ost: 607.407 Nord: 5.991.175

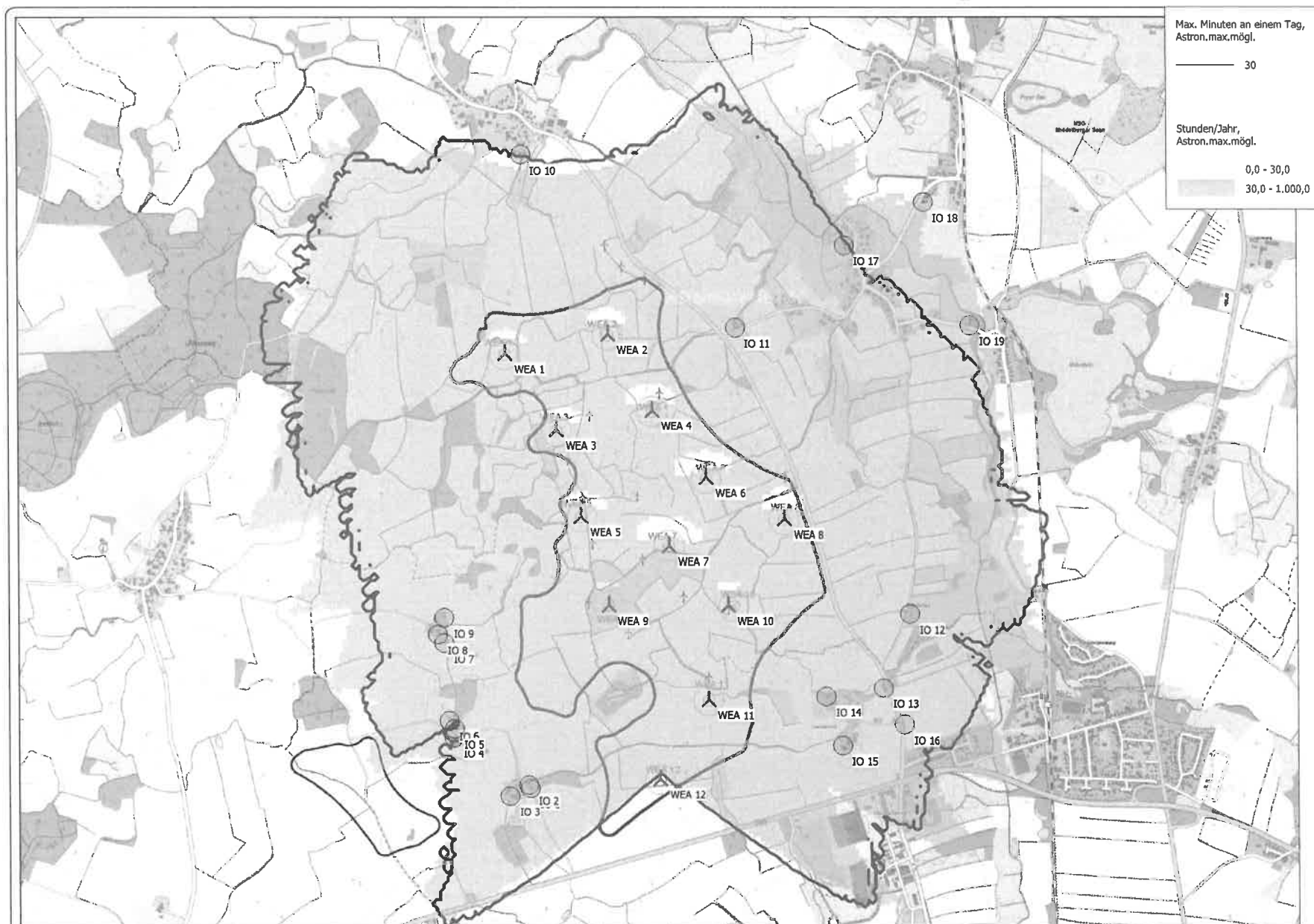
Höhe der Schattenkarte: Höhenlinien: CONTOURLINE_ONLINEDATA_0.wpo (1)

Projekt:
19-095-GBK-02

Beschreibung:
Schattenwurfgutachten für die
Errichtung und den Betrieb neuer
Windenergieanlagen im Rahmen des
Repowering-Vorhabens im Windpark
Kedorf

**SHADOW -
Karte**
Berechnung:
Zusatzbelastung

Überarbeitete Anwender:
T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
23.08.2019 08:54/3.2.744



Neue WEA

Schattenrezeptor

Karte: Lageplan_TK25, Maßstab 1:20.000, Mitte: UTM (north)-ETRS89 Zone: 32 Ost: 607.407 Nord: 5.991.175

Höhe der Schattenkarte: Höhenlinien: CONTOURLINE_ONLINEDATA_0.wpo (1)

Projekt:
19-095-GBK-02

Beschreibung:
Schattenwurfgutachten für die
Errichtung und den Betrieb neuer
Windenergieanlagen im Rahmen des
Repowering-Vorhabens im Windpark
Kesdorf

**SHADOW -
Karte**
Berechnung:
Zusatzbelastung

Lizenzierter Anwender:
T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Bereich: 23.08.2019 09:03/3.2.744

Anlage 4
Berechnungsergebnisse Gesamtbelastung

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
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 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 28.08.2019 10:21/3.2.744

SHADOW - Hauptergebnis

Berechnung: Gesamtbelastung

Voraussetzungen für Berechnung des Schattenwurfs

Beschattungsbereich der WEA

Schatten nur relevant, wo Rotorblatt mind. 20% der Sonne verdeckt

Siehe WEA-Tabelle

Minimale relevante Sonnenhöhe über Horizont

3 °

Tage zwischen Berechnungen

1 Tag(e)

Berechnungszeitsprung

1 Minuten

Die dargestellten Zeiten sind die astronomisch maximal mögliche

Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

Eine WEA wird nicht berücksichtigt, wenn sie von keinem Teil der

Rezeptorfläche aus sichtbar ist. Die Sichtbarkeitsberechnung basiert auf

den folgenden Annahmen:

Verwendete Höhenlinien: Höhenlinien: CONTOURLINE_ONLINEDATA_0.wpo (1)

Hindernisse in Berechnung verwendet

Berechnungshöhe ü.Gr. für Karte: 1,5 m

Rasterauflösung: 1,0 m

Alle Koordinatenangaben in:

UTM (north)-ETRS89 Zone: 32

WEA

	Ost	Nord	Z	Beschreibung	WEA-Typ		Typ	Nenn- leistung	Rotor- durch- messer	Naben- höhe	Schattendaten	
					Ak- tu- ell	Hersteller					Beschatt.- Bereich	U/min
			[m]					[kW]	[m]	[m]	[m]	[U/min]
1	606.556	5.991.795	52,4	WEA 1	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
2	607.097	5.991.895	50,0	WEA 2	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
3	606.825	5.991.392	50,0	WEA 3	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
4	607.330	5.991.494	50,0	WEA 4	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
5	606.955	5.990.935	50,0	WEA 5	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
6	607.614	5.991.141	50,0	WEA 6	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
7	607.418	5.990.784	45,2	WEA 7	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
8	608.025	5.990.923	40,7	WEA 8	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
9	607.098	5.990.474	44,3	WEA 9	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
10	607.729	5.990.474	39,9	WEA 10	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
11	607.625	5.989.978	36,8	WEA 11	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
12	607.367	5.989.560	40,0	WEA 12	Ja	GE WIND ENERGY	5.5-158 Thrust 700-5.500	5.500	158,0	120,9	1.819	0,0
13	605.812	5.989.324	50,5	WEA VB - SWT-...	Ja	Siemens	SWT-3.2-113 2A-3.200	3.200	113,0	127,5	1.685	0,0

Schattenrezeptor-Eingabe

Nr.	Name	Ost	Nord	Z	Breite	Höhe	Höhe ü.Gr.	Neigung des Fensters	Ausrichtungsmodus	Augenhöhe (ZVI) ü.Gr.
				[m]	[m]	[m]	[m]	[°]		[m]
A	IO 1	606.679	5.989.510	48,2	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0
B	IO 2	606.671	5.989.527	47,4	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0
C	IO 3	606.572	5.989.470	46,8	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0
D	IO 4	606.279	5.989.776	48,5	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0
E	IO 5	606.282	5.989.825	49,7	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0
F	IO 6	606.253	5.989.867	50,0	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0
G	IO 7	606.228	5.990.275	50,0	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0
H	IO 8	606.195	5.990.322	50,0	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0
I	IO 9	606.228	5.990.409	50,0	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0
J	IO 10	606.644	5.992.832	53,8	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0
K	IO 11	607.772	5.991.929	45,9	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0
L	IO 12	608.687	5.990.429	26,6	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0
M	IO 13	608.548	5.990.038	26,7	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0
N	IO 14	608.243	5.989.995	30,0	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0
O	IO 15	608.331	5.989.736	30,0	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0
P	IO 16	608.657	5.989.846	23,4	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0
Q	IO 17	608.349	5.992.356	20,0	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0
R	IO 18	608.766	5.992.585	28,5	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0
S	IO 19	609.010	5.991.942	20,0	1,0	1,0	2,0	90,0	"Gewächshaus-Modus"	3,0

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
28.08.2019 10:21/3.2.744**SHADOW - Hauptergebnis****Berechnung: Gesamtbelastung****Berechnungsergebnisse**

Schattenrezeptor

astron. max. mögl. Beschattungsdauer			
Nr.	Name	Stunden/Jahr	Schattentage/Jahr
		[h/a]	[d/a]
A	IO 1	103:25	204
B	IO 2	96:38	181
C	IO 3	81:51	174
D	IO 4	70:34	200
E	IO 5	77:47	218
F	IO 6	93:35	241
G	IO 7	103:45	265
H	IO 8	89:02	237
I	IO 9	106:42	249
J	IO 10	15:12	39
K	IO 11	199:16	231
L	IO 12	86:30	213
M	IO 13	109:54	205
N	IO 14	117:15	227
O	IO 15	129:30	160
P	IO 16	63:09	169
Q	IO 17	56:29	143
R	IO 18	13:35	57
S	IO 19	34:41	118

Gesamtmenge der max. mögl. Beschattung an Rezeptoren pro WEA

Nr.	Name	Maximal
		[h/a]
1	WEA 1	13:42
2	WEA 2	80:02
3	WEA 3	21:35
4	WEA 4	88:34
5	WEA 5	72:20
6	WEA 6	107:03
7	WEA 7	75:11
8	WEA 8	18:58
9	WEA 9	158:52
10	WEA 10	114:41
11	WEA 11	258:50
12	WEA 12	172:32
13	WEA VB - SWT-3.2-113	95:45

Summen in Rezeptortabelle und WEA-Tabelle können sich unterscheiden, da eine WEA gleichzeitig an zwei oder mehr Rezeptoren Beschattung verursachen kann und/oder ein Rezeptor gleichzeitig von zwei oder mehr WEA beschattet werden kann.

Projekt:

19-095-GBK-02

Beschreibung:

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im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

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+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: A - IO 1

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35	08:06	07:08	06:53	07:18 (12)	05:43
	16:02	16:53	17:50	19:49	33 07:51 (12)	20:45
2	08:35	08:04	07:06	06:50	07:16 (12)	05:41
	16:04	16:55	17:52	19:51	37 07:53 (12)	20:47
3	08:35	08:02	07:04	06:48	07:14 (12)	05:39
	16:05	16:57	17:54	19:53	40 07:54 (12)	20:48
4	08:35	08:01	07:01	06:46	07:11 (12)	05:37
	16:06	16:59	17:56	19:54	44 07:55 (12)	20:50
5	08:35	07:59	06:59	06:43	07:10 (12)	05:35
	16:07	17:01	17:58	19:56	46 07:56 (12)	20:52
6	08:34	07:57	06:57	06:41	07:08 (12)	05:33
	16:08	17:04	18:00	19:58	48 07:56 (12)	20:54
7	08:34	07:55	06:54	06:38	07:08 (12)	05:31
	16:10	17:06	18:01	20:00	48 07:56 (12)	20:56
8	08:33	07:53	06:52	06:36	07:06 (12)	05:29
	16:11	17:08	18:03	20:02	50 07:56 (12)	20:58
9	08:33	07:51	06:49	06:33	07:06 (12)	05:27
	16:13	17:10	18:05	20:04	51 07:57 (12)	20:59
10	08:32	07:49	06:47	06:31	07:05 (12)	05:25
	16:14	17:12	18:07	20:06	52 07:57 (12)	21:01
11	08:31	07:47	06:45	06:28	07:04 (12)	05:23
	16:15	17:14	18:09	20:08	52 07:56 (12)	21:03
12	08:31	07:46	06:42	06:26	07:04 (12)	05:21
	16:17	17:16	18:11	20:09	53 07:57 (12)	21:05
13	08:30	07:43	06:40	17:30 (13)	07:04 (12)	05:19
	16:19	17:18	18:13	20:11	53 07:57 (12)	21:06
14	08:29	07:41	06:37	17:25 (13)	07:03 (12)	05:18
	16:20	17:20	18:15	20:13	53 07:56 (12)	21:08
15	08:28	07:39	06:35	17:23 (13)	07:03 (12)	05:16
	16:22	17:22	18:17	20:15	53 07:56 (12)	21:10
16	08:27	07:37	06:32	17:21 (13)	07:03 (12)	05:14
	16:24	17:24	18:19	20:17	53 07:56 (12)	21:12
17	08:26	07:35	06:30	17:20 (13)	07:03 (12)	05:12
	16:25	17:26	18:21	20:19	51 07:54 (12)	21:13
18	08:25	07:33	06:27	17:18 (13)	07:03 (12)	05:11
	16:27	17:28	18:23	20:21	51 07:54 (12)	21:15
19	08:24	07:31	06:25	17:18 (13)	07:03 (12)	05:09
	16:29	17:30	18:24	20:22	51 07:54 (12)	21:17
20	08:23	07:29	06:23	17:17 (13)	07:04 (12)	05:08
	16:31	17:32	18:26	20:24	49 07:53 (12)	21:18
21	08:22	07:27	06:20	17:17 (13)	07:04 (12)	05:06
	16:32	17:34	18:28	20:26	48 07:52 (12)	21:20
22	08:21	07:24	06:18	17:16 (13)	07:04 (12)	05:05
	16:34	17:36	18:30	20:28	47 07:51 (12)	21:21
23	08:19	07:22	06:15	17:16 (13)	07:05 (12)	05:03
	16:36	17:38	18:32	20:30	45 07:50 (12)	21:23
24	08:18	07:20	06:13	17:15 (13)	07:05 (12)	05:02
	16:38	17:40	18:34	20:32	44 07:49 (12)	21:25
25	08:17	07:18	06:10	17:16 (13)	07:06 (12)	05:00
	16:40	17:42	18:36	20:34	42 07:48 (12)	21:26
26	08:15	07:15	06:08	17:16 (13)	07:07 (12)	04:59
	16:42	17:44	18:38	20:36	39 07:46 (12)	21:27
27	08:14	07:13	06:05	17:17 (13)	07:08 (12)	04:58
	16:44	17:46	18:39	20:37	37 07:45 (12)	21:29
28	08:12	07:11	06:03	06:28 (12)	07:10 (12)	04:57
	16:46	17:48	18:41	20:39	33 07:43 (12)	21:30
29	08:11		06:00	06:26 (12)	07:11 (12)	04:55
	16:48		18:43	20:41	30 07:41 (12)	21:32
30	08:09		05:58	06:23 (12)	07:13 (12)	04:54
	16:49		18:45	20:43	26 07:39 (12)	21:33
31	08:08		06:55	07:21 (12)		04:53
	16:51		19:47	18:32 (13)		21:34
Sonnenscheinstunden	248	271	365	419	494	511
astr.max.mögl.Beschattung				1359	885	387

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)		Zeitpunkt (SS:MM) Schattenende	(WEA mit letztem Schatten)

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: A - IO 1

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober	November	Dezember
1	04:47 21:52	06:04 (11) 21:17	05:59 (11) 20:11	07:03 (12) 18:15	18:06 (13) 07:13	08:09 15:59
2	04:47 21:52	06:04 (11) 21:15	06:01 (11) 20:08	07:03 (12) 18:54	18:19 (13) 16:45	08:11 15:58
3	04:48 21:51	06:04 (11) 21:14	06:02 (11) 20:06	07:03 (12) 18:51	18:14 (13) 16:43	08:12 15:58
4	04:49 21:51	06:03 (11) 21:12	06:04 (11) 20:03	07:03 (12) 18:49		08:14 15:57
5	04:50 21:50	06:02 (11) 21:10	06:05 (11) 20:01	07:03 (12) 18:47		08:15 15:56
6	04:51 21:50	06:02 (11) 21:08	06:07 (11) 19:58	07:03 (12) 18:44		08:17 15:56
7	04:52 21:49	06:01 (11) 21:06	06:09 (11) 19:56	07:04 (12) 18:42		08:18 15:55
8	04:53 21:48	06:01 (11) 21:04	06:10 (11) 19:54	07:04 (12) 18:39		08:19 15:55
9	04:54 21:48	06:01 (11) 21:02	06:12 (11) 19:51	07:04 (12) 18:37		08:21 15:54
10	04:55 21:47	06:00 (11) 21:00	06:14 (11) 19:49	07:06 (12) 18:34		08:22 15:54
11	04:56 21:46	06:00 (11) 20:58	06:15 (11) 19:46	07:08 (12) 18:32		08:23 15:54
12	04:57 21:45	05:59 (11) 20:56	06:17 (11) 19:44	07:09 (12) 18:30		08:24 15:53
13	04:58 21:44	05:59 (11) 20:54	07:23 (12) 19:41	07:11 (12) 18:27		08:25 15:53
14	04:59 21:43	05:58 (11) 20:52	07:21 (12) 19:39	07:13 (12) 18:25		08:26 15:53
15	05:01 21:42	05:59 (11) 20:50	07:19 (12) 19:36	07:14 (12) 18:23		08:27 15:53
16	05:02 21:41	05:58 (11) 20:47	07:16 (12) 19:34	07:16 (12) 18:20		08:28 15:53
17	05:03 21:40	05:58 (11) 20:45	07:15 (12) 19:31	07:19 (12) 18:18		08:29 15:53
18	05:05 21:39	05:57 (11) 20:43	07:14 (12) 19:29	18:05 (13) 18:16		08:30 15:53
19	05:06 21:37	05:57 (11) 20:41	07:12 (12) 19:26	18:30 (13) 18:13		08:31 15:54
20	05:07 21:36	05:57 (11) 20:39	07:11 (12) 19:24	18:02 (13) 18:11		08:31 15:54
21	05:09 21:35	05:57 (11) 20:36	07:10 (12) 19:21	18:02 (13) 18:09		08:32 15:54
22	05:10 21:33	05:56 (11) 20:34	07:10 (12) 19:19	18:01 (13) 18:06		08:33 15:55
23	05:12 21:32	05:57 (11) 20:32	07:08 (12) 19:16	18:01 (13) 18:04		08:33 15:55
24	05:13 21:30	05:56 (11) 20:29	07:08 (12) 19:14	18:00 (13) 18:02		08:34 15:56
25	05:15 21:29	05:57 (11) 20:27	07:07 (12) 19:11	18:00 (13) 18:00		08:34 15:56
26	05:16 21:27	05:56 (11) 20:25	07:06 (12) 19:09	18:01 (13) 17:58		08:35 15:57
27	05:18 21:26	05:56 (11) 20:22	07:05 (12) 19:06	18:01 (13) 16:55		08:35 15:58
28	05:20 21:24	05:56 (11) 20:20	07:05 (12) 19:04	18:02 (13) 16:53		08:35 15:58
29	05:21 21:22	05:57 (11) 20:18	07:04 (12) 19:01	18:02 (13) 16:51		08:35 15:59
30	05:23 21:21	05:56 (11) 20:15	07:04 (12) 18:59	18:03 (13) 16:49		08:35 16:00
31	05:25 21:19	05:58 (11) 20:13	07:04 (12) 18:57	18:22 (13) 16:47		08:35 16:01
Sonnenscheinstunden	514	462	384	330	259	232
astr.max.mögl.Beschattung	885	1068	1089	17		

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang (WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende (WEA mit letztem Schatten)

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Keskorf

Lizenzierter Anwender:

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DE-28717 Bremen

+49 (0) 421 79 400 600

info@th-ingenieure.de

Berechnet:

28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: B - IO 2

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35	08:06	07:08	06:53	07:18 (12)	05:43
	16:02	16:53	17:50	19:49	07:59 (12)	20:45
2	08:35	08:04	07:06	06:50	07:16 (12)	05:41
	16:04	16:55	17:52	19:51	08:00 (12)	20:47
3	08:35	08:02	07:04	06:48	07:15 (12)	05:39
	16:05	16:57	17:54	19:53	08:01 (12)	20:48
4	08:35	08:01	07:01	06:46	07:14 (12)	05:37
	16:06	16:59	17:56	19:54	08:01 (12)	20:50
5	08:35	07:59	06:59	06:43	07:13 (12)	05:35
	16:07	17:01	17:58	19:56	08:02 (12)	20:52
6	08:34	07:57	06:57	06:41	07:12 (12)	05:33
	16:08	17:04	18:00	19:58	08:01 (12)	20:54
7	08:34	07:55	06:54	06:38	07:11 (12)	05:31
	16:10	17:06	18:01	20:00	08:02 (12)	20:56
8	08:33	07:53	06:52	06:36	07:10 (12)	05:29
	16:11	17:08	18:03	20:02	08:01 (12)	20:58
9	08:33	07:51	06:49	06:33	07:10 (12)	05:27
	16:13	17:10	18:05	20:04	08:02 (12)	20:59
10	08:32	07:49	06:47	06:31	07:10 (12)	05:25
	16:14	17:12	18:07	20:06	08:02 (12)	21:01
11	08:31	07:47	06:45	06:28	07:09 (12)	05:23
	16:15	17:14	18:09	20:08	08:01 (12)	21:03
12	08:31	07:46	06:42	17:24 (13)	07:09 (12)	05:21
	16:17	17:16	18:11	17:35 (13)	08:01 (12)	21:05
13	08:30	07:43	06:40	17:21 (13)	07:09 (12)	05:19
	16:19	17:18	18:13	17:38 (13)	08:01 (12)	21:06
14	08:29	07:41	06:37	17:18 (13)	07:08 (12)	05:18
	16:20	17:20	18:15	17:39 (13)	08:00 (12)	21:08
15	08:28	07:39	06:35	17:17 (13)	07:08 (12)	05:16
	16:22	17:22	18:17	17:41 (13)	07:59 (12)	21:10
16	08:27	07:37	06:32	17:15 (13)	07:09 (12)	05:14
	16:24	17:24	18:19	17:41 (13)	07:59 (12)	21:12
17	08:26	07:35	06:30	17:15 (13)	07:08 (12)	05:12
	16:25	17:26	18:21	17:42 (13)	07:57 (12)	21:13
18	08:25	07:33	06:27	17:13 (13)	07:09 (12)	05:11
	16:27	17:28	18:23	17:42 (13)	07:57 (12)	21:15
19	08:24	07:31	06:25	17:13 (13)	07:09 (12)	05:09
	16:29	17:30	18:24	17:42 (13)	07:56 (12)	21:17
20	08:23	07:29	06:23	17:12 (13)	07:10 (12)	05:08
	16:31	17:32	18:26	17:42 (13)	07:55 (12)	21:18
21	08:22	07:27	06:20	17:13 (13)	07:11 (12)	05:06
	16:32	17:34	18:28	17:42 (13)	07:54 (12)	21:20
22	08:21	07:24	06:18	17:12 (13)	07:11 (12)	05:05
	16:34	17:36	18:30	17:41 (13)	07:52 (12)	21:21
23	08:19	07:22	06:15	17:12 (13)	07:12 (12)	05:03
	16:36	17:38	18:32	17:41 (13)	07:51 (12)	21:23
24	08:18	07:20	06:13	17:12 (13)	07:13 (12)	05:02
	16:38	17:40	18:34	17:39 (13)	07:50 (12)	21:25
25	08:17	07:18	06:10	17:13 (13)	07:14 (12)	05:00
	16:40	17:42	18:36	17:39 (13)	07:48 (12)	21:26
26	08:15	07:15	06:08	06:33 (12)	07:16 (12)	04:59
	16:42	17:44	18:38	17:37 (13)	07:46 (12)	21:27
27	08:14	07:13	06:05	06:31 (12)	07:18 (12)	04:58
	16:44	17:46	18:39	17:36 (13)	07:44 (12)	21:29
28	08:12	07:11	06:03	06:28 (12)	07:20 (12)	04:57
	16:46	17:48	18:41	17:33 (13)	07:42 (12)	21:30
29	08:11		06:00	06:26 (12)	07:23 (12)	04:55
	16:48		18:43	17:31 (13)	07:38 (12)	21:32
30	08:09		05:58	06:23 (12)	06:13 (11)	04:54
	16:49		18:45	06:57 (12)	06:14 (11)	21:33
31	08:08		06:55	07:21 (12)		04:53
	16:51		19:47	07:58 (12)		21:34
Sonnenscheinstunden	248	271	365	419	494	511
astr.max.mögl.Beschattung			588	1268	884	141

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang (WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenende (WEA mit letztem Schatten)

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: B - IO 2

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Jul	August	September	Oktober	November	Dezember
1	04:47	05:26	06:00 (11)	06:21	07:08 (12)	07:15
	21:52	21:17	20:11	52	08:00 (12)	18:56
2	04:47	05:28	06:01 (11)	06:23	07:08 (12)	07:17
	21:52	21:15	20:08	52	08:00 (12)	18:54
3	04:48	05:30	06:02 (11)	06:25	07:08 (12)	07:18
	21:51	21:14	20:06	52	08:00 (12)	18:51
4	04:49	05:31	06:04 (11)	06:26	07:08 (12)	07:20
	21:51	21:12	20:03	52	08:00 (12)	18:49
5	04:50	06:12 (11)	05:33	06:05 (11)	06:28	07:07 (12)
	21:50	21:10	20:01	51	07:58 (12)	18:47
6	04:51	06:10 (11)	05:35	06:07 (11)	06:30	07:07 (12)
	21:50	21:08	19:58	51	07:58 (12)	18:44
7	04:52	06:09 (11)	05:36	06:09 (11)	06:32	07:07 (12)
	21:49	21:06	19:56	51	07:58 (12)	18:42
8	04:53	06:08 (11)	05:38	06:10 (11)	06:33	07:07 (12)
	21:48	21:04	19:54	49	07:56 (12)	18:39
9	04:54	06:08 (11)	05:40	06:12 (11)	06:35	07:07 (12)
	21:48	21:02	19:51	48	07:55 (12)	18:37
10	04:55	06:07 (11)	05:42	06:14 (11)	06:37	07:08 (12)
	21:47	21:00	19:49	47	07:55 (12)	18:34
11	04:56	06:06 (11)	05:43	06:15 (11)	06:39	07:09 (12)
	21:46	20:58	19:46	45	07:54 (12)	18:32
12	04:57	06:05 (11)	05:45	06:17 (11)	06:41	07:09 (12)
	21:45	20:56	19:44	43	07:52 (12)	18:30
13	04:58	06:05 (11)	05:47	06:18 (11)	06:42	07:11 (12)
	21:44	20:54	19:41	39	07:50 (12)	18:27
14	04:59	06:04 (11)	05:49	06:20 (11)	06:44	07:13 (12)
	21:43	20:52	19:39	36	07:49 (12)	18:25
15	05:01	06:04 (11)	05:51	07:31 (12)	06:46	07:14 (12)
	21:42	20:50	19:36	37	18:17 (13)	18:23
16	05:02	06:04 (11)	05:52	07:27 (12)	06:48	07:16 (12)
	21:41	20:47	19:34	42	18:21 (13)	18:20
17	05:03	06:03 (11)	05:54	07:25 (12)	06:49	07:18 (12)
	21:40	20:45	19:31	42	18:23 (13)	18:18
18	05:05	06:02 (11)	05:56	07:23 (12)	06:51	07:20 (12)
	21:39	20:43	19:29	41	18:25 (13)	18:16
19	05:06	06:02 (11)	05:58	07:20 (12)	06:53	07:22 (12)
	21:37	20:41	19:26	35	18:25 (13)	18:13
20	05:07	06:02 (11)	05:59	07:19 (12)	06:55	17:59 (13)
	21:36	20:39	19:24	26	18:25 (13)	18:11
21	05:09	06:01 (11)	06:01	07:18 (12)	06:57	17:59 (13)
	21:35	20:36	19:21	27	18:26 (13)	18:09
22	05:10	06:01 (11)	06:03	07:17 (12)	06:58	17:58 (13)
	21:33	20:34	19:19	28	18:26 (13)	18:06
23	05:12	06:01 (11)	06:05	07:15 (12)	07:00	17:57 (13)
	21:32	20:32	19:16	29	18:26 (13)	18:04
24	05:13	06:00 (11)	06:07	07:14 (12)	07:02	17:56 (13)
	21:30	20:29	19:14	29	18:25 (13)	18:02
25	05:15	06:01 (11)	06:08	07:13 (12)	07:04	17:56 (13)
	21:29	20:27	19:11	29	18:25 (13)	18:00
26	05:16	06:00 (11)	06:10	07:12 (12)	07:06	17:56 (13)
	21:27	20:25	19:09	29	18:25 (13)	17:58
27	05:18	06:00 (11)	06:12	07:11 (12)	07:07	17:56 (13)
	21:26	20:22	19:06	28	18:24 (13)	16:55
28	05:20	06:00 (11)	06:14	07:11 (12)	07:09	17:57 (13)
	21:24	20:20	19:04	26	18:23 (13)	16:53
29	05:21	06:00 (11)	06:16	07:09 (12)	07:11	17:56 (13)
	21:22	20:18	19:01	25	18:21 (13)	16:51
30	05:23	06:00 (11)	06:17	07:09 (12)	07:13	17:57 (13)
	21:21	20:15	18:59	23	18:20 (13)	16:49
31	05:25	06:00 (11)	06:19	07:09 (12)		07:11
	21:19	20:13	18:59	52	08:01 (12)	16:47
Sonnenscheinstunden	514	462	384	330	259	232
astr.max.mögl.Beschattung	725	980	1164	48		

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)
Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenende	(WEA mit letztem Schatten)

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH

Bremerhavener Heerstraße 10

DE-28717 Bremen

+49 (0) 421 79 400 600

info@th-ingenieure.de

Berechnet:

28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: C - IO 3

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35	08:06	07:08	06:53	07:18 (12)	05:43
	16:02	16:53	17:50	19:49	18:42 (13)	20:45
2	08:35	08:04	07:06	06:50	07:16 (12)	05:41
	16:04	16:55	17:52	19:51	18:41 (13)	20:47
3	08:35	08:02	07:04	06:48	07:14 (12)	05:39
	16:05	16:57	17:54	19:53	18:40 (13)	20:48
4	08:35	08:01	07:01	06:46	07:11 (12)	05:37
	16:06	16:59	17:56	19:54	18:38 (13)	20:50
5	08:35	07:59	06:59	06:43	07:09 (12)	05:35
	16:07	17:01	17:58	19:56	18:35 (13)	20:52
6	08:34	07:57	06:57	06:41	07:06 (12)	05:33
	16:08	17:04	18:00	19:58	18:30 (13)	20:54
7	08:34	07:55	06:54	06:38	07:04 (12)	05:31
	16:10	17:06	18:01	20:00	07:41 (12)	20:56
8	08:33	07:53	06:52	06:36	07:01 (12)	05:29
	16:11	17:08	18:03	20:02	07:41 (12)	20:58
9	08:33	07:51	06:49	06:33	07:00 (12)	05:27
	16:13	17:10	18:05	20:04	07:42 (12)	20:59
10	08:32	07:49	06:47	06:31	06:59 (12)	05:25
	16:14	17:12	18:07	20:06	07:43 (12)	21:01
11	08:31	07:48	06:45	06:29	06:58 (12)	05:23
	16:15	17:14	18:09	20:08	07:42 (12)	21:03
12	08:31	07:46	06:42	06:26	06:58 (12)	05:21
	16:17	17:16	18:11	20:09	07:43 (12)	21:05
13	08:30	07:43	06:40	06:24	06:57 (12)	05:19
	16:19	17:18	18:13	20:11	07:43 (12)	21:06
14	08:29	07:41	06:37	06:21	06:56 (12)	05:18
	16:20	17:20	18:15	20:13	07:42 (12)	21:08
15	08:28	07:39	06:35	06:19	06:56 (12)	05:16
	16:22	17:22	18:17	20:15	07:42 (12)	21:10
16	08:27	07:37	06:32	17:32 (13)	06:56 (12)	05:14
	16:24	17:24	18:19	20:17	07:42 (12)	21:12
17	08:26	07:35	06:30	17:26 (13)	06:56 (12)	05:12
	16:25	17:26	18:21	20:19	07:41 (12)	21:13
18	08:25	07:33	06:27	17:23 (13)	06:56 (12)	05:11
	16:27	17:28	18:23	20:21	07:41 (12)	21:15
19	08:24	07:31	06:25	17:21 (13)	06:56 (12)	05:09
	16:29	17:30	18:24	20:22	07:40 (12)	21:17
20	08:23	07:29	06:23	17:19 (13)	06:57 (12)	05:08
	16:31	17:32	18:26	20:24	07:40 (12)	21:18
21	08:22	07:27	06:20	17:18 (13)	06:57 (12)	05:06
	16:32	17:34	18:28	20:26	07:39 (12)	21:20
22	08:21	07:24	06:18	17:16 (13)	06:57 (12)	05:05
	16:34	17:36	18:30	20:28	07:37 (12)	21:21
23	08:19	07:22	06:15	17:16 (13)	06:57 (12)	05:03
	16:36	17:38	18:32	20:30	07:37 (12)	21:23
24	08:18	07:20	06:13	17:15 (13)	06:58 (12)	05:02
	16:38	17:40	18:34	20:32	07:36 (12)	21:25
25	08:17	07:18	06:10	17:14 (13)	06:59 (12)	05:00
	16:40	17:42	18:36	20:34	07:34 (12)	21:26
26	08:15	07:15	06:08	17:14 (13)	07:00 (12)	04:59
	16:42	17:44	18:38	20:36	07:33 (12)	21:28
27	08:14	07:13	06:05	17:14 (13)	07:01 (12)	04:58
	16:44	17:46	18:39	20:37	07:32 (12)	21:29
28	08:12	07:11	06:03	17:13 (13)	07:03 (12)	04:57
	16:46	17:48	18:41	20:39	07:30 (12)	21:30
29	08:11		06:00	17:14 (13)	07:04 (12)	04:55
	16:48		18:43	20:41	07:28 (12)	21:32
30	08:09		05:58	17:13 (13)	07:07 (12)	04:54
	16:50		18:45	20:43	07:25 (12)	21:33
31	08:08		06:55	07:21 (12)		04:53
	16:51		19:47	18:44 (13)		21:34
Sonnenscheinstunden	248	271	365	419	494	511
astr. max. mögl. Beschattung			439	1206	744	60

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
28.08.2019 10:21/3.2.744**SHADOW - Kalender****Berechnung: Gesamtbelastung Schattenrezeptor: C - IO 3****Voraussetzungen für Berechnung des Schattenwurfs**

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli		August		September		Oktober		November		Dezember	
1	04:47		05:26		05:59 (11)	06:21	06:56 (12)	07:15	07:13	08:09		
	21:52		21:17	32	06:31 (11)	20:11	46	07:42 (12)	18:56	16:45	15:59	
2	04:47		05:28		06:01 (11)	06:23		06:57 (12)	07:17	07:15	08:11	
	21:52		21:15	30	06:31 (11)	20:08	44	07:41 (12)	18:54	16:43	15:58	
3	04:48		05:30		06:02 (11)	06:25		06:57 (12)	07:18	07:17	08:12	
	21:51		21:14	29	06:31 (11)	20:06	44	07:41 (12)	18:51	16:41	15:58	
4	04:49		05:31		06:04 (11)	06:26		06:57 (12)	07:20	07:19	08:14	
	21:51		21:12	27	06:31 (11)	20:03	43	07:40 (12)	18:49	16:39	15:57	
5	04:50		05:33		06:05 (11)	06:28		06:57 (12)	07:22	07:21	08:15	
	21:50		21:10	25	06:30 (11)	20:01	42	07:39 (12)	18:47	16:37	15:56	
6	04:51		05:35		06:07 (11)	06:30		06:59 (12)	07:24	07:23	08:17	
	21:50		21:08	23	06:30 (11)	19:58	39	07:38 (12)	18:44	16:35	15:56	
7	04:52		05:36		06:09 (11)	06:32		07:01 (12)	07:26	07:25	08:18	
	21:49		21:06	20	06:29 (11)	19:56	36	07:37 (12)	18:42	16:33	15:55	
8	04:53		05:38		06:10 (11)	06:33		07:02 (12)	07:28	07:27	08:19	
	21:48		21:04	18	06:28 (11)	19:54	44	18:28 (13)	18:39	16:31	15:55	
9	04:54		05:40		06:12 (11)	06:35		07:04 (12)	07:29	07:29	08:21	
	21:48		21:02	15	06:27 (11)	19:51	47	18:31 (13)	18:37	16:29	15:54	
10	04:55		05:42		06:14 (11)	06:37		07:06 (12)	07:31	07:31	08:22	
	21:47		21:00	12	06:26 (11)	19:49	48	18:33 (13)	18:34	16:28	15:54	
11	04:56		05:43		06:15 (11)	06:39		07:08 (12)	07:33	07:33	08:23	
	21:46	8	06:17 (11)	20:58	9	06:24 (11)	19:46	47	18:34 (13)	18:32	16:26	15:54
12	04:57		06:08 (11)	05:45		06:17 (11)	06:41		07:09 (12)	07:35	07:35	08:24
	21:45	11	06:19 (11)	20:56	6	06:23 (11)	19:44	44	18:34 (13)	18:30	16:24	15:53
13	04:58		06:06 (11)	05:47		06:19 (11)	06:42		07:11 (12)	07:37	07:37	08:25
	21:44	15	06:21 (11)	20:54	12	07:29 (12)	19:41	41	18:35 (13)	18:27	16:23	15:53
14	04:59		06:05 (11)	05:49		07:15 (12)	06:44		18:05 (13)	07:39	07:39	08:26
	21:43	17	06:22 (11)	20:52	17	07:32 (12)	19:39	31	18:36 (13)	18:25	16:21	15:53
15	05:01		06:05 (11)	05:51		07:12 (12)	06:46		18:04 (13)	07:41	07:41	08:27
	21:42	19	06:24 (11)	20:50	23	07:35 (12)	19:36	32	18:36 (13)	18:23	16:19	15:53
16	05:02		06:04 (11)	05:52		07:10 (12)	06:48		18:03 (13)	07:42	07:43	08:28
	21:41	21	06:25 (11)	20:47	26	07:36 (12)	19:34	32	18:35 (13)	18:20	16:18	15:53
17	05:03		06:03 (11)	05:54		07:08 (12)	06:50		18:02 (13)	07:44	07:44	08:29
	21:40	22	06:25 (11)	20:45	30	07:38 (12)	19:31	33	18:35 (13)	18:18	16:16	15:53
18	05:05		06:02 (11)	05:56		07:07 (12)	06:51		18:02 (13)	07:46	07:46	08:30
	21:39	24	06:26 (11)	20:43	32	07:39 (12)	19:29	33	18:35 (13)	18:16	16:15	15:53
19	05:06		06:02 (11)	05:58		07:05 (12)	06:53		18:01 (13)	07:48	07:48	08:31
	21:37	24	06:26 (11)	20:41	35	07:40 (12)	19:26	33	18:34 (13)	18:13	16:13	15:54
20	05:07		06:02 (11)	05:59		07:04 (12)	06:55		18:01 (13)	07:50	07:50	08:31
	21:36	26	06:28 (11)	20:39	37	07:41 (12)	19:24	33	18:34 (13)	18:11	16:12	15:54
21	05:09		06:01 (11)	06:01		07:03 (12)	06:57		18:01 (13)	07:52	07:52	08:32
	21:35	27	06:28 (11)	20:36	39	07:42 (12)	19:21	32	18:33 (13)	18:09	16:10	15:54
22	05:10		06:01 (11)	06:03		07:02 (12)	06:58		18:01 (13)	07:54	07:54	08:33
	21:33	28	06:29 (11)	20:34	41	07:43 (12)	19:19	32	18:33 (13)	18:06	16:09	15:55
23	05:12		06:00 (11)	06:05		07:01 (12)	07:00		18:02 (13)	07:56	07:55	08:33
	21:32	30	06:30 (11)	20:32	42	07:43 (12)	19:16	30	18:32 (13)	18:04	16:08	15:55
24	05:13		06:00 (11)	06:07		07:00 (12)	07:02		18:02 (13)	07:58	07:57	08:34
	21:30	30	06:30 (11)	20:29	43	07:43 (12)	19:14	28	18:30 (13)	18:02	16:06	15:56
25	05:15		06:00 (11)	06:08		07:00 (12)	07:04		18:03 (13)	08:00	07:59	08:34
	21:29	31	06:31 (11)	20:27	44	07:44 (12)	19:11	25	18:28 (13)	18:00	16:05	15:56
26	05:16		05:59 (11)	06:10		06:59 (12)	07:06		18:04 (13)	08:02	08:01	08:35
	21:27	31	06:30 (11)	20:25	44	07:43 (12)	19:09	23	18:27 (13)	17:58	16:04	15:57
27	05:18		05:59 (11)	06:12		06:58 (12)	07:07		18:06 (13)	07:04	08:02	08:35
	21:26	32	06:31 (11)	20:22	46	07:44 (12)	19:06	19	18:25 (13)	16:55	16:03	15:58
28	05:20		05:59 (11)	06:14		06:58 (12)	07:09		18:08 (13)	07:06	08:04	08:35
	21:24	32	06:31 (11)	20:20	46	07:44 (12)	19:04	14	18:22 (13)	16:53	16:02	15:58
29	05:21		05:59 (11)	06:16		06:57 (12)	07:11			07:07	08:06	08:35
	21:22	33	06:32 (11)	20:18	46	07:43 (12)	19:01			16:51	16:01	15:59
30	05:23		05:59 (11)	06:17		06:57 (12)	07:13			07:09	08:07	08:35
	21:21	32	06:31 (11)	20:15	46	07:43 (12)	18:59			16:49	16:00	16:00
31	05:25		05:59 (11)	06:19		06:57 (12)				07:11		08:35
	21:19	33	06:32 (11)	20:13	46	07:43 (12)				16:47		16:01
Sonnenscheinstunden		514		462		384		330		259		232
astr.max.mögl.Beschattung			526		941		995					

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende	(WEA mit letztem Schatten)
	Minuten mit Schatten		

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: D - IO 4

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	
1	08:35 16:02	08:06 16:53	15:28 (13) 17:50	07:08 19:49	05:43 20:45	04:52 21:36	
2	08:35 16:04	08:04 16:55	15:26 (13) 17:52	06:50 19:51	05:41 20:47	04:51 21:37	
3	08:35 16:05	08:02 16:57	15:26 (13) 17:54	06:48 19:53	05:39 20:48	04:50 21:38	
4	08:35 16:06	08:01 16:59	15:26 (13) 17:56	06:46 19:54	05:37 20:50	04:49 21:39	
5	08:35 16:07	07:59 17:02	15:25 (13) 17:58	06:43 19:56	05:35 20:52	04:48 21:41	
6	08:34 16:08	07:57 17:04	15:24 (13) 18:00	06:41 19:58	05:33 20:54	04:48 21:42	
7	08:34 16:10	07:55 17:06	15:24 (13) 18:01	06:38 19:59	05:31 20:56	04:47 21:43	
8	08:33 16:11	07:53 17:08	15:24 (13) 18:03	06:36 20:02	05:29 20:58	04:46 21:44	
9	08:33 16:13	07:51 17:10	15:23 (13) 18:05	06:33 20:04	05:27 20:59	04:45 21:45	
10	08:32 16:14	07:49 17:12	15:22 (13) 18:07	06:31 20:06	05:25 21:01	04:45 21:46	05:19 (9)
11	08:32 16:15	07:48 17:14	15:22 (13) 18:09	06:29 20:08	05:23 21:03	04:45 21:46	05:19 (9)
12	08:31 16:17	07:46 17:16	15:22 (13) 18:11	06:26 20:09	05:21 21:05	04:44 21:47	05:19 (9)
13	08:30 16:19	07:44 17:18	15:22 (13) 18:13	06:24 20:11	05:19 21:06	04:44 21:48	05:18 (9)
14	08:29 16:20	07:41 17:20	15:23 (13) 18:15	06:21 20:13	05:18 21:08	04:43 21:49	05:18 (9)
15	08:28 16:22	07:39 17:22	15:23 (13) 18:17	06:19 20:15	05:16 21:10	04:43 21:49	05:18 (9)
16	08:27 16:24	07:37 17:24	15:23 (13) 18:19	06:17 20:17	05:14 21:12	04:43 21:50	05:18 (9)
17	08:26 16:25	07:35 17:26	15:23 (13) 18:21	06:14 20:19	05:12 21:13	04:43 21:50	05:18 (9)
18	08:25 16:27	07:33 17:28	15:24 (13) 18:23	06:12 20:21	05:11 21:15	04:43 21:51	05:18 (9)
19	08:24 16:29	07:31 17:30	15:25 (13) 18:24	06:10 20:23	05:09 21:17	04:43 21:51	05:18 (9)
20	08:23 16:31	07:29 17:32	15:25 (13) 18:26	06:07 20:24	05:08 21:18	04:43 21:52	05:18 (9)
21	08:22 16:32	07:27 17:34	15:26 (13) 18:28	06:05 20:26	05:06 21:20	04:43 21:52	05:18 (9)
22	08:21 16:34	07:24 17:36	15:28 (13) 18:30	06:03 20:28	05:05 21:21	04:43 21:52	05:18 (9)
23	08:19 16:36	07:22 17:38	15:29 (13) 18:32	06:00 20:30	05:03 21:23	04:43 21:53	05:19 (9)
24	08:18 16:38	07:20 17:40	15:31 (13) 18:34	05:58 20:32	05:02 21:25	04:43 21:53	05:19 (9)
25	08:17 16:40	07:18 17:42	15:34 (13) 18:36	05:56 20:34	05:00 21:26	04:44 21:53	05:19 (9)
26	08:15 16:42	07:15 17:44	15:37 (13) 18:38	05:54 20:36	04:59 21:28	04:44 21:53	05:20 (9)
27	08:14 16:44	07:13 17:46	15:47 (13) 18:40	05:52 20:37	04:58 21:29	04:44 21:53	05:20 (9)
28	08:12 16:46	15:36 (13) 17:11	18:41	05:49 20:39	04:57 21:30	04:45 21:53	05:21 (9)
29	08:11 16:48	15:33 (13) 17:48	18:43	05:47 20:41	04:55 21:32	04:45 21:52	05:21 (9)
30	08:09 16:50	15:31 (13) 17:52	18:45	05:45 20:43	04:54 21:33	04:46 21:52	05:22 (9)
31	08:08 16:51	15:29 (13) 17:54	18:47	05:43 20:45	04:53 21:34	04:46 21:52	05:22 (9)
Sonnenscheinstunden	248	271	365	419	494	511	168
astr.max.mögl.Beschattung	74	881	468	297	293	168	

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang (WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenende (WEA mit letztem Schatten)

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH

Bremerhavener Heerstraße 10

DE-28717 Bremen

+49 (0) 421 79 400 600

info@th-ingenieure.de

Berechnet:

28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: D - IO 4

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli		August		September		Oktober		November		Dezember					
1	04:47		05:22 (9)	05:26	06:01 (10)	06:21	06:51 (11)	07:15	07:44 (12)	07:13	14:52 (13)	08:09				
	21:52	6	05:28 (9)	21:17	22	06:23 (10)	20:11	26	07:17 (11)	18:56	33	08:17 (12)	16:45	40	15:32 (13)	15:59
2	04:47		05:23 (9)	05:28	06:01 (10)	06:23	06:52 (11)	07:17	07:45 (12)	07:15	14:52 (13)	08:11				
	21:52	5	05:28 (9)	21:15	23	06:24 (10)	20:08	26	07:18 (11)	18:54	32	08:17 (12)	16:43	40	15:32 (13)	15:58
3	04:48		05:24 (9)	05:30	06:02 (10)	06:25	06:54 (11)	07:18	07:47 (12)	07:17	14:52 (13)	08:12				
	21:51	3	05:27 (9)	21:14	21	06:23 (10)	20:06	24	07:18 (11)	18:51	29	08:16 (12)	16:41	40	15:32 (13)	15:58
4	04:49		05:25 (9)	05:31	06:04 (10)	06:26	06:56 (11)	07:20	07:49 (12)	07:19	14:52 (13)	08:14				
	21:51	2	05:27 (9)	21:12	20	06:24 (10)	20:03	21	07:17 (11)	18:49	26	08:15 (12)	16:39	39	15:31 (13)	15:57
5	04:50			05:33	06:06 (10)	06:28	06:57 (11)	07:22	07:51 (12)	07:21	14:53 (13)	08:15				
	21:50			21:10	18	06:24 (10)	20:01	19	07:16 (11)	18:47	24	08:15 (12)	16:37	39	15:32 (13)	15:56
6	04:51			05:35	06:07 (10)	06:30	06:59 (11)	07:24	07:52 (12)	07:23	14:54 (13)	08:17				
	21:50			21:08	16	06:23 (10)	19:58	17	07:16 (11)	18:44	21	08:13 (12)	16:35	37	15:31 (13)	15:56
7	04:52			05:36	06:09 (10)	06:32	07:01 (11)	07:26	07:54 (12)	07:25	14:54 (13)	08:18				
	21:49			21:06	14	06:23 (10)	19:56	14	07:15 (11)	18:42	17	08:11 (12)	16:33	36	15:30 (13)	15:55
8	04:53			05:38	06:10 (10)	06:33	07:02 (11)	07:28	07:56 (12)	07:27	14:55 (13)	08:19				
	21:48			21:04	12	06:22 (10)	19:54	11	07:13 (11)	18:39	14	08:10 (12)	16:31	34	15:29 (13)	15:55
9	04:54			05:40	06:12 (10)	06:35	07:04 (11)	07:29	07:58 (12)	07:29	14:56 (13)	08:21				
	21:48			21:02	10	06:22 (10)	19:51	8	07:12 (11)	18:37	10	08:08 (12)	16:30	32	15:28 (13)	15:54
10	04:55			05:42	06:14 (10)	06:37	07:06 (11)	07:31	08:00 (12)	07:31	14:57 (13)	08:22				
	21:47			21:00	8	06:22 (10)	19:49	4	07:10 (11)	18:34	5	08:05 (12)	16:28	30	15:27 (13)	15:54
11	04:56			05:43	06:15 (10)	06:39		07:33		07:33		14:59 (13)	08:23			
	21:46			20:58	5	06:20 (10)	19:46		18:32		16:26	28	15:27 (13)	15:54		
12	04:57			05:45	06:17 (10)	06:41		07:35		07:35		15:00 (13)	08:24			
	21:45			20:56	2	06:19 (10)	19:44		18:30		16:24	26	15:26 (13)	15:53		
13	04:58			05:47		06:42		07:37		07:37		15:02 (13)	08:25			
	21:44			20:54		19:41		18:27		16:23	22	15:24 (13)	15:53			
14	04:59			05:49		06:44		07:39		07:39		15:04 (13)	08:26			
	21:43			20:52		19:39		18:25		16:21	19	15:23 (13)	15:53			
15	05:01			05:51		06:46		07:41		07:41		15:06 (13)	08:27			
	21:42			20:50		19:36		18:23		16:19	14	15:20 (13)	15:53			
16	05:02			05:52		06:48		07:42		07:43		15:10 (13)	08:28			
	21:41			20:47		19:34		18:20		16:18	6	15:16 (13)	15:53			
17	05:03			05:54		06:50		07:44		16:10 (13)	07:44		08:29			
	21:40			20:45		19:31		18:18	9	16:19 (13)	16:16		15:53			
18	05:05			05:56		06:51		07:46		16:06 (13)	07:46		08:30			
	21:39			20:43		19:29		18:16	17	16:23 (13)	16:15		15:53			
19	05:06			05:58		06:53		07:48		16:03 (13)	07:48		08:31			
	21:37			20:41		19:26		18:13	22	16:25 (13)	16:13		15:54			
20	05:07			05:59		06:55		07:50		16:00 (13)	07:50		08:32			
	21:36			20:39		19:24		18:11	27	16:27 (13)	16:12		15:54			
21	05:09			06:01		06:57		07:57 (12)	07:52	15:59 (13)	07:52		08:32			
	21:35			20:36		19:21	13	08:10 (12)	18:09	29	16:28 (13)	16:10		15:54		
22	05:10			06:03		06:58		07:54 (12)	07:54	15:57 (13)	07:54		08:33			
	21:33			20:34		19:19	19	08:13 (12)	18:06	32	16:29 (13)	16:09		15:55		
23	05:12			06:05		07:00		07:52 (12)	07:56	15:56 (13)	07:56		08:33			
	21:32			20:32		19:16	23	08:15 (12)	18:04	34	16:30 (13)	16:08		15:55		
24	05:13			06:07		07:02		07:50 (12)	07:58	15:55 (13)	07:57		08:34			
	21:30	5	06:14 (10)	20:29		19:14	25	08:15 (12)	18:02	36	16:31 (13)	16:06		15:56		
25	05:15			06:07 (10)	06:08		07:03 (11)	07:04		15:54 (13)	07:59		08:34			
	21:29	10	06:17 (10)	20:27	8	07:11 (11)	19:11	27	08:16 (12)	18:00	37	16:31 (13)	16:05		15:56	
26	05:16			06:05 (10)	06:10		06:59 (11)	07:06		07:48 (12)	08:02		15:53 (13)	08:01		08:35
	21:27	13	06:18 (10)	20:25	14	07:13 (11)	19:09	29	08:17 (12)	17:58	38	16:31 (13)	16:04		15:57	
27	05:18			06:04 (10)	06:12		06:57 (11)	07:07		07:47 (12)	07:04		14:52 (13)	08:03		08:35
	21:26	16	06:20 (10)	20:23	18	07:15 (11)	19:06	30	08:17 (12)	16:55	40	15:32 (13)	16:03		15:58	
28	05:20			06:03 (10)	06:14		06:56 (11)	07:09		07:46 (12)	07:06		14:53 (13)	08:04		08:35
	21:24	18	06:21 (10)	20:20	21	07:17 (11)	19:04	32	08:18 (12)	16:53	40	15:33 (13)	16:02		15:58	
29	05:21			06:03 (10)	06:16		06:54 (11)	07:11		07:45 (12)	07:08		14:52 (13)	08:06		08:35
	21:22	19	06:22 (10)	20:18	23	07:17 (11)	19:01	32	08:17 (12)	16:51	41	15:33 (13)	16:01		15:59	
30	05:23			06:02 (10)	06:17		06:53 (11)	07:13		07:44 (12)	07:09		14:52 (13)	08:08		08:35
	21:21	20	06:22 (10)	20:15	24	07:17 (11)	18:59	33	08:17 (12)	16:49	41	15:33 (13)	16:00		16:00	
31	05:25			06:01 (10)	06:19		06:52 (11)			07:11		14:52 (13)			08:35	
	21:19	22	06:23 (10)	20:13	26	07:18 (11)			16:47	40	15:32 (13)				16:01	
Sonnenscheinstunden		514		462		384		330		259		232				
astr.max.mögl.Beschattung		139		305		433		694		482						

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattenende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: E - IO 5

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 16:02	08:06 16:53	15:15 (13) 17:50	07:08 (12) 19:49	06:53 19:49	07:18 (11) 20:45
2	08:35 16:04	08:04 16:55	15:14 (13) 17:52	07:33 (12) 19:51	06:50 19:51	07:16 (11) 20:47
3	08:35 16:05	08:02 16:57	15:15 (13) 17:54	07:30 (12) 19:53	06:48 19:53	07:14 (11) 20:48
4	08:35 16:06	08:01 16:59	15:15 (13) 17:56	07:28 (12) 19:54	06:46 19:54	07:11 (11) 20:50
5	08:35 16:07	07:59 17:01	15:15 (13) 17:58	07:25 (12) 19:56	06:43 19:56	07:09 (11) 20:52
6	08:34 16:08	07:57 17:04	15:15 (13) 18:00	07:23 (12) 19:58	06:41 19:58	07:06 (11) 20:54
7	08:34 16:10	07:55 17:06	15:15 (13) 18:01	07:21 (12) 20:00	06:38 20:00	07:04 (11) 20:56
8	08:33 16:11	07:53 17:08	15:15 (13) 18:03	07:18 (12) 20:02	06:36 20:02	07:01 (11) 20:58
9	08:33 16:13	07:51 17:10	15:15 (13) 18:05	07:16 (12) 20:04	06:33 20:04	06:59 (11) 20:59
10	08:32 16:14	07:49 17:12	15:15 (13) 18:07	07:13 (12) 20:06	06:31 20:06	07:00 (11) 21:01
11	08:32 16:15	07:48 17:14	15:15 (13) 18:09	07:12 (12) 20:08	06:29 20:08	06:59 (11) 21:03
12	08:31 16:17	07:46 17:16	15:16 (13) 18:11	07:11 (12) 20:10	06:26 20:10	07:00 (11) 21:05
13	08:30 16:19	07:44 17:18	15:16 (13) 18:13	07:10 (12) 20:12	06:24 20:12	07:01 (11) 21:07
14	08:29 16:20	07:41 17:20	15:17 (13) 18:15	07:09 (12) 20:14	06:21 20:14	07:02 (11) 21:09
15	08:28 16:22	07:39 17:22	15:18 (13) 18:17	07:08 (12) 20:16	06:19 20:16	07:03 (11) 21:11
16	08:27 16:24	07:37 17:24	15:19 (13) 18:19	07:07 (12) 20:18	06:17 20:18	07:04 (11) 21:13
17	08:26 16:25	07:35 17:26	15:20 (13) 18:21	07:06 (12) 20:20	06:15 20:20	07:05 (11) 21:15
18	08:25 16:27	07:33 17:28	15:22 (13) 18:23	07:05 (12) 20:22	06:13 20:22	07:06 (11) 21:17
19	08:24 16:29	07:31 17:30	15:25 (13) 18:24	07:04 (12) 20:24	06:11 20:24	07:07 (11) 21:19
20	08:23 16:31	07:29 17:32	15:27 (13) 18:26	07:03 (12) 20:26	06:09 20:26	07:08 (11) 21:21
21	08:22 16:32	15:28 (13) 17:34	07:27 18:28	07:02 (12) 20:28	06:07 20:28	07:09 (11) 21:23
22	08:21 16:34	15:33 (13) 17:36	07:24 18:30	07:01 (12) 20:30	06:05 20:30	07:10 (11) 21:25
23	08:19 16:36	15:37 (13) 17:38	07:22 18:32	07:00 (12) 20:32	06:03 20:32	07:11 (11) 21:27
24	08:18 16:38	15:40 (13) 17:40	07:20 18:34	06:59 (12) 20:34	06:01 20:34	07:12 (11) 21:29
25	08:17 16:40	15:41 (13) 17:42	07:18 18:36	06:58 (12) 20:36	05:59 20:36	07:13 (11) 21:31
26	08:15 16:42	15:44 (13) 17:44	07:15 18:38	06:57 (12) 20:38	05:57 20:38	07:14 (11) 21:33
27	08:14 16:44	15:45 (13) 17:46	07:13 18:40	06:56 (12) 20:40	05:55 20:40	07:15 (11) 21:35
28	08:12 16:46	15:46 (13) 17:48	07:11 18:42	06:55 (12) 20:42	05:53 20:42	07:16 (11) 21:37
29	08:11 16:48	15:48 (13) 17:50	07:09 18:44	06:54 (12) 20:44	05:51 20:44	07:17 (11) 21:39
30	08:09 16:50	15:49 (13) 17:51	07:07 18:45	06:53 (12) 20:45	05:49 20:45	07:18 (11) 21:41
31	08:08 16:51	15:50 (13) 17:52	07:05 18:46	06:52 (12) 20:46	05:47 20:46	07:19 (11) 21:43
Sonnenscheinstunden	248	271	365	419	494	511
astr. max. mögl. Beschattung	266	671	463	299	273	535

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang (WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende (WEA mit letztem Schatten)
	Minuten mit Schatten	

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
Bremerhavener Heerstraße 10
DE-28717 Bremen
+49 (0) 421 79 400 600
info@th-ingenieure.de
Berechnet:
28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: E - IO 5

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

Juli		August		September		Oktober		November		Dezember	
1	04:47	05:22 (7)	05:26	06:08 (10)	06:21	06:59 (11)	07:15	07:53 (12)	07:13	14:45 (13)	08:09
	21:52	05:42 (9)	21:17	06:26 (10)	20:11	07:22 (11)	18:56	08:24 (12)	16:45	15:22 (13)	15:59
2	04:47	05:23 (7)	05:28	06:07 (10)	06:23	06:58 (11)	07:17	07:52 (12)	07:15	14:44 (13)	08:11
	21:52	05:42 (9)	21:15	06:28 (10)	20:08	07:23 (11)	18:54	08:24 (12)	16:43	15:22 (13)	15:58
3	04:48	05:24 (7)	05:30	06:06 (10)	06:25	06:58 (11)	07:18	07:52 (12)	07:17	14:44 (13)	08:12
	21:51	05:42 (9)	21:14	06:27 (10)	20:06	07:23 (11)	18:51	08:24 (12)	16:41	15:22 (13)	15:58
4	04:49	05:25 (7)	05:31	06:06 (10)	06:26	06:57 (11)	07:20	07:51 (12)	07:19	14:44 (13)	08:14
	21:51	05:42 (9)	21:12	06:28 (10)	20:03	07:24 (11)	18:49	08:24 (12)	16:39	15:22 (13)	15:57
5	04:50	05:25 (9)	05:33	06:06 (10)	06:28	06:57 (11)	07:22	07:51 (12)	07:21	14:44 (13)	08:15
	21:50	05:41 (9)	21:10	06:29 (10)	20:01	07:23 (11)	18:47	08:24 (12)	16:37	15:23 (13)	15:56
6	04:51	05:26 (9)	05:35	06:07 (10)	06:30	06:59 (11)	07:24	07:52 (12)	07:23	14:44 (13)	08:17
	21:50	05:41 (9)	21:08	06:29 (10)	19:58	07:23 (11)	18:44	08:22 (12)	16:35	15:23 (13)	15:56
7	04:52	05:27 (9)	05:36	06:09 (10)	06:32	07:01 (11)	07:26	07:54 (12)	07:25	14:44 (13)	08:18
	21:49	05:41 (9)	21:06	06:29 (10)	19:56	07:23 (11)	18:42	08:22 (12)	16:33	15:23 (13)	15:55
8	04:53	05:28 (9)	05:38	06:10 (10)	06:33	07:02 (11)	07:28	07:56 (12)	07:27	14:44 (13)	08:19
	21:48	05:40 (9)	21:04	06:28 (10)	19:54	07:21 (11)	18:39	08:21 (12)	16:31	15:23 (13)	15:55
9	04:54	05:29 (9)	05:40	06:12 (10)	06:35	07:04 (11)	07:29	07:58 (12)	07:29	14:45 (13)	08:21
	21:48	05:40 (9)	21:02	06:28 (10)	19:51	07:21 (11)	18:37	08:20 (12)	16:30	15:22 (13)	15:54
10	04:55	05:30 (9)	05:42	06:14 (10)	06:37	07:06 (11)	07:31	08:00 (12)	07:31	14:45 (13)	08:22
	21:47	05:39 (9)	21:00	06:28 (10)	19:49	07:20 (11)	18:34	08:19 (12)	16:28	15:22 (13)	15:54
11	04:56	05:31 (9)	05:43	06:15 (10)	06:39	07:08 (11)	07:33	08:02 (12)	07:33	14:46 (13)	08:23
	21:46	05:38 (9)	20:58	06:27 (10)	19:46	07:19 (11)	18:32	08:18 (12)	16:26	15:22 (13)	15:54
12	04:57	05:32 (9)	05:45	06:17 (10)	06:41	07:09 (11)	07:35	08:04 (12)	07:35	14:47 (13)	08:24
	21:45	05:37 (9)	20:56	06:27 (10)	19:44	07:17 (11)	18:30	08:17 (12)	16:24	15:22 (13)	15:53
13	04:58	05:33 (9)	05:47	06:19 (10)	06:42	07:11 (11)	07:37	08:06 (12)	07:37	14:47 (13)	08:25
	21:44	05:35 (9)	20:54	06:27 (10)	19:41	07:15 (11)	18:27	08:15 (12)	16:23	15:21 (13)	15:53
14	04:59		05:49	06:20 (10)	06:44		07:39	08:08 (12)	07:39	14:48 (13)	08:26
	21:43		20:52	06:25 (10)	19:39		18:25	08:12 (12)	16:21	15:21 (13)	15:53
15	05:01		05:51	06:22 (10)	06:46		07:41		07:41	14:49 (13)	08:27
	21:42		20:50	06:24 (10)	19:36		18:23		16:19	15:20 (13)	15:53
16	05:02		05:52		06:48		07:42		07:43	14:50 (13)	08:28
	21:41		20:47		19:34		18:20		16:18	15:19 (13)	15:53
17	05:03		05:54		06:50		07:44		07:44	14:51 (13)	08:29
	21:40		20:45		19:31		18:18		16:16	15:18 (13)	15:53
18	05:05		05:56		06:51		07:46		07:46	14:52 (13)	08:30
	21:39		20:43		19:29		18:16		16:15	15:17 (13)	15:53
19	05:06		05:58		06:53		07:48		07:48	14:54 (13)	08:31
	21:37		20:41		19:26		18:13		16:13	15:16 (13)	15:54
20	05:07		05:59		06:55		07:50		07:50	14:55 (13)	08:32
	21:36		20:39		19:24		18:11		16:12	15:15 (13)	15:54
21	05:09		06:01		06:57		07:52		07:52	14:59 (13)	08:32
	21:35		20:36		19:21		18:09		16:10	15:14 (13)	15:54
22	05:10		06:03		06:58		07:54		07:54	15:02 (13)	08:33
	21:33		20:34		19:19		18:06		16:09	15:11 (13)	15:55
23	05:12		06:05		07:00		07:56	15:58 (13)	07:56		08:33
	21:32		20:32		19:16		18:04	16:11 (13)	16:08		15:55
24	05:13		06:07		07:02		07:58	15:55 (13)	07:57		08:34
	21:30		20:29		19:14	2	08:11 (12)	16:14 (13)	16:06		15:56
25	05:15		06:08		07:04		08:03 (12)	15:52 (13)	07:59		08:34
	21:29		20:27		19:11	14	08:17 (12)	16:16 (13)	16:05		15:56
26	05:16		06:10		07:06		08:00 (12)	15:50 (13)	08:01		08:35
	21:27		20:25		19:09	20	08:20 (12)	16:17 (13)	16:04		15:57
27	05:18		06:12		07:07		07:58 (12)	14:49 (13)	08:03		08:35
	21:26		20:23		19:06	23	08:21 (12)	15:18 (13)	16:03		15:58
28	05:20		06:14		07:09		07:57 (12)	14:48 (13)	08:04		08:35
	21:24	8	06:21 (10)	20:20	3	07:14 (11)	19:04	15:20 (13)	16:02		15:58
29	05:21		06:16		07:05 (11)	07:11	07:55 (12)	14:47 (13)	08:06		08:35
	21:22	11	06:23 (10)	20:18	13	07:18 (11)	19:01	15:21 (13)	16:01		15:59
30	05:23		06:17		07:03 (11)	07:13	08:22 (12)	14:46 (13)	08:08		08:35
	21:21	14	06:24 (10)	20:15	17	07:20 (11)	18:59	15:21 (13)	16:00		16:00
31	05:25		06:19		07:02 (11)		07:54 (12)	14:45 (13)			08:35
	21:19	17	06:26 (10)	20:13	20	07:22 (11)		15:22 (13)			16:01
Sonnenscheinstunden		514	462		384		330		259		232
astr.max.mögl.Beschattung		215		285		386		577		697	

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang (WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Minuten mit Schatten
		Zeitpunkt (SS:MM) Schattenende (WEA mit letztem Schatten)

Projekt: 19-095-GBK-02	Beschreibung: Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kesdorf	Lizenzierter Anwender: T&H Ingenieure GmbH Bremerhavener Heerstraße 10 DE-28717 Bremen +49 (0) 421 79 400 600 info@th-ingenieure.de Berechnet: 28.08.2019 10:21/3.2.744
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SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: F - IO 6

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar		Februar		März		April		Mai		Juni							
1	08:35		08:06		14:58 (13)	07:08	07:35 (12)	06:53	07:18 (11)	05:43	06:11 (10)	04:52	05:25 (7)					
	16:02		16:53	39	15:37 (13)	17:50	14	07:49 (12)	19:49	15	07:33 (11)	20:45	22	05:47 (9)				
2	08:35		08:04		14:58 (13)	07:06	07:33 (12)	06:50	07:16 (11)	05:41	06:09 (10)	04:51	05:24 (7)					
	16:04		16:55	39	15:37 (13)	17:52	17	07:50 (12)	19:51	18	07:34 (11)	20:47	24	05:48 (9)				
3	08:35		08:02		15:00 (13)	07:04	07:30 (12)	06:48	07:14 (11)	05:39	06:07 (10)	04:50	05:23 (7)					
	16:05		16:57	38	15:38 (13)	17:54	20	07:50 (12)	19:53	20	07:34 (11)	20:49	25	05:48 (9)				
4	08:35		08:01		15:00 (13)	07:01	07:28 (12)	06:46	07:11 (11)	05:37	06:05 (10)	04:49	05:23 (7)					
	16:06		16:59	38	15:38 (13)	17:56	23	07:51 (12)	19:54	22	07:33 (11)	20:50	26	05:49 (9)				
5	08:35		07:59		15:00 (13)	06:59	07:25 (12)	06:43	07:09 (11)	05:35	06:03 (10)	04:48	05:22 (7)					
	16:07		17:01	37	15:37 (13)	17:58	26	07:51 (12)	19:56	24	07:33 (11)	20:52	28	05:50 (9)				
6	08:34		07:57		15:01 (13)	06:57	07:23 (12)	06:41	07:06 (11)	05:33	06:02 (10)	04:47	05:21 (7)					
	16:08		17:04	36	15:37 (13)	18:00	29	07:52 (12)	19:58	26	07:32 (11)	20:54	29	05:50 (9)				
7	08:34		07:55		15:02 (13)	06:54	07:21 (12)	06:38	07:07 (11)	05:31	06:02 (10)	04:47	05:21 (7)					
	16:10		17:06	35	15:37 (13)	18:01	31	07:52 (12)	20:00	25	07:32 (11)	20:56	30	05:51 (9)				
8	08:33		07:53		15:02 (13)	06:52	07:20 (12)	06:36	07:06 (11)	05:29	06:03 (10)	04:46	05:20 (7)					
	16:11		17:08	34	15:36 (13)	18:03	31	07:51 (12)	20:02	24	07:30 (11)	20:58	31	05:51 (9)				
9	08:33		07:51		15:03 (13)	06:49	07:20 (12)	06:33	07:07 (11)	05:27	06:04 (10)	04:46	05:20 (7)					
	16:13		17:10	33	15:36 (13)	18:05	31	07:51 (12)	20:04	22	07:29 (11)	20:59	31	05:51 (9)				
10	08:32		07:50		15:03 (13)	06:47	07:20 (12)	06:31	07:09 (11)	05:25	06:05 (10)	04:45	05:19 (7)					
	16:14		17:12	31	15:34 (13)	18:07	30	07:50 (12)	20:06	19	07:28 (11)	21:01	32	05:51 (9)				
11	08:32		07:48		15:05 (13)	06:45	07:20 (12)	06:29	07:09 (11)	05:23	06:06 (10)	04:45	05:19 (7)					
	16:15		17:14	28	15:33 (13)	18:09	30	07:50 (12)	20:08	17	07:26 (11)	21:03	33	05:52 (9)				
12	08:31	15:08 (13)	07:46		15:06 (13)	06:42	07:20 (12)	06:26	07:11 (11)	05:21	06:08 (10)	04:44	05:19 (7)					
	16:17	9	15:17 (13)	17:16	26	15:32 (13)	18:11	28	07:48 (12)	20:09	13	07:24 (11)	21:05	10	06:18 (10)	21:47	34	05:53 (9)
13	08:30		15:06 (13)	07:44		15:09 (13)	06:40	07:21 (12)	06:24	07:17 (11)	05:19	06:11 (10)	04:44	05:18 (7)				
	16:19	14	15:20 (13)	17:18	21	15:30 (13)	18:13	27	07:48 (12)	20:11	1	07:18 (11)	21:06	4	06:15 (10)	21:48	34	05:52 (9)
14	08:29		15:05 (13)	07:41		15:11 (13)	06:37	07:22 (12)	06:21	05:18	04:43	05:18 (7)						
	16:20	17	15:22 (13)	17:20	17	15:28 (13)	18:15	24	07:46 (12)	20:13	21:08	21:49	35	05:53 (9)				
15	08:28		15:03 (13)	07:39		15:15 (13)	06:35	07:23 (12)	06:19	05:16	04:43	05:18 (7)						
	16:22	20	15:23 (13)	17:22	10	15:25 (13)	18:17	21	07:44 (12)	20:15	21:10	21:49	35	05:53 (9)				
16	08:27		15:02 (13)	07:37		15:14 (13)	06:32	07:24 (12)	06:17	05:14	04:43	05:18 (7)						
	16:24	22	15:24 (13)	17:24		15:19	18	07:42 (12)	20:17	21:12	21:50	35	05:53 (9)					
17	08:26		15:02 (13)	07:35		15:26 (13)	06:30	07:28 (12)	06:14	05:12	04:43	05:18 (7)						
	16:25	24	15:26 (13)	17:26		18:21	11	07:39 (12)	20:19	21:13	21:50	36	05:54 (9)					
18	08:25		15:01 (13)	07:33		18:23		06:12	05:11	04:43	05:18 (7)							
	16:27	27	15:28 (13)	17:28		18:23		20:21	21:15	21:51	36	05:54 (9)						
19	08:24		15:00 (13)	07:31		18:24		06:10	05:09	04:43	05:18 (7)							
	16:29	28	15:28 (13)	17:30		18:24		20:23	21:17	21:51	36	05:54 (9)						
20	08:23		15:00 (13)	07:29		18:26		06:07	05:08	04:43	05:18 (7)							
	16:31	30	15:30 (13)	17:32		18:26		20:24	21:18	21:52	36	05:54 (9)						
21	08:22		15:00 (13)	07:27		18:28		06:05	05:06	04:43	05:18 (7)							
	16:32	31	15:31 (13)	17:34		18:28		20:26	21:20	21:52	37	05:55 (9)						
22	08:21		14:59 (13)	07:24		18:30		06:03	05:05	04:43	05:18 (7)							
	16:34	33	15:32 (13)	17:36		18:30		20:28	21:21	21:52	37	05:55 (9)						
23	08:19		14:59 (13)	07:22		18:32		06:00	05:03	04:43	05:19 (7)							
	16:36	34	15:33 (13)	17:38		18:32		20:30	21:23	2	05:36 (9)	21:52	37	05:56 (9)				
24	08:18		14:59 (13)	07:20		18:34		05:58	05:02	05:33 (9)	04:43	05:19 (7)						
	16:38	34	15:33 (13)	17:40		18:34		20:32	21:25	6	05:39 (9)	21:53	36	05:55 (9)				
25	08:17		14:59 (13)	07:18		18:36		05:56	05:00	05:32 (9)	04:44	05:19 (7)						
	16:40	36	15:35 (13)	17:42		18:36		20:34	21:26	9	05:41 (9)	21:53	36	05:55 (9)				
26	08:15		14:59 (13)	07:15	07:42 (12)	06:08	05:54	04:59	06:21 (10)	04:59	05:31 (9)	04:44	05:20 (7)					
	16:42	36	15:35 (13)	17:44	1	07:43 (12)	18:38	20:36	2	06:23 (10)	21:28	11	05:42 (9)	21:53	36	05:56 (9)		
27	08:14		14:58 (13)	07:13	07:40 (12)	06:05	05:52	04:58	05:19 (10)	04:58	05:30 (9)	04:44	05:20 (7)					
	16:44	37	15:35 (13)	17:46	6	07:46 (12)	18:40	20:37	5	06:24 (10)	21:29	13	05:43 (9)	21:53	36	05:56 (9)		
28	08:12		14:59 (13)	07:11	07:38 (12)	06:03	05:49	04:57	05:29 (9)	04:57	05:29 (9)	04:45	05:21 (7)					
	16:46	37	15:36 (13)	17:48	10	07:48 (12)	18:41	1	06:29 (11)	20:39	8	06:25 (10)	21:30	16	05:45 (9)	21:53	35	05:56 (9)
29	08:11		14:59 (13)	07:09	06:00	05:47	04:55	05:28 (9)	04:55	05:28 (9)	04:45	05:21 (7)						
	16:48	38	15:37 (13)	17:50	18:43	5	06:31 (11)	20:41	10	06:25 (10)	21:32	17	05:45 (9)	21:52	35	05:56 (9)		
30	08:09		14:58 (13)	07:07	05:58	18:45	9	06:32 (11)	20:43	13	06:13 (10)	04:54	05:27 (9)	04:46	05:22 (7)			
	16:50	39	15:37 (13)	17:51	06:55	19:47	12	07:33 (11)	20:43	13	06:26 (10)	21:33	19	05:46 (9)	21:52	35	05:57 (9)	
31	08:08		14:58 (13)	07:05	06:55	19:47	12	07:33 (11)	20:43	13	06:26 (10)	21:33	19	05:46 (9)	21:52	35	05:57 (9)	
	16:51	39	15:37 (13)	17:51	06:55	19:47	12	07:33 (11)	20:43	13	06:26 (10)	21:33	19	05:46 (9)	21:52	35	05:57 (9)	
Sonnenscheinstunden	248	585	271	479	365	438	419	284	334	511	988							
astr. max. mögl. Beschattung																		

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang (WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende (WEA mit letztem Schatten)

Projekt: 19-095-GBK-02	Beschreibung: Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kesdorf	Lizenzierter Anwender: T&H Ingenieure GmbH Bremerhavener Heerstraße 10 DE-28717 Bremen +49 (0) 421 79 400 600 info@th-ingenieure.de Berechnet: 28.08.2019 10:21/3.2.744
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SHADOW - Kalender

Berechnung: Gesamtbelastung **Schattenrezeptor:** F - IO 6

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

Juli		August		September		Oktober		November		Dezember	
1	04:47	05:22 (7)	05:26	06:22 (10)	06:21	07:12 (11)	07:15	08:01 (12)	07:13	14:35 (13)	08:09
2	21:52	34 05:56 (9)	21:17	2 06:24 (10)	20:11	9 07:21 (11)	18:56	25 08:26 (12)	16:45	27 15:02 (13)	15:59
3	04:47	05:23 (7)	05:28	9 06:19 (10)	06:23	15 07:09 (11)	07:17	27 08:00 (12)	07:15	30 14:33 (13)	08:11
4	21:52	33 05:56 (9)	21:15	9 06:28 (10)	20:08	15 07:24 (11)	18:54	27 08:27 (12)	16:43	30 15:03 (13)	15:58
5	04:48	05:24 (7)	05:30	14 06:16 (10)	06:25	19 07:07 (11)	07:18	28 07:59 (12)	07:17	32 14:32 (13)	08:12
6	21:51	33 05:57 (9)	21:14	14 06:30 (10)	20:06	19 07:26 (11)	18:51	28 08:27 (12)	16:41	32 15:04 (13)	15:58
7	04:49	05:25 (7)	05:31	16 06:15 (10)	06:26	21 07:06 (11)	07:20	30 07:58 (12)	07:19	34 14:31 (13)	08:14
8	21:51	32 05:57 (9)	21:12	16 06:31 (10)	20:03	21 07:27 (11)	18:49	30 08:28 (12)	16:39	34 15:05 (13)	15:57
9	04:50	05:25 (7)	05:33	19 06:14 (10)	06:28	23 07:04 (11)	07:22	31 07:57 (12)	07:21	35 14:31 (13)	08:15
10	21:50	31 05:56 (9)	21:10	19 06:33 (10)	20:01	23 07:27 (11)	18:47	31 08:28 (12)	16:37	35 15:06 (13)	15:56
11	04:51	05:26 (7)	05:35	20 06:13 (10)	06:30	25 07:03 (11)	07:24	31 07:56 (12)	07:23	36 14:31 (13)	08:17
12	21:50	30 05:56 (9)	21:08	20 06:33 (10)	19:58	25 07:28 (11)	18:44	31 08:27 (12)	16:35	36 15:07 (13)	15:56
13	04:52	05:27 (7)	05:36	21 06:13 (10)	06:32	26 07:02 (11)	07:26	31 07:56 (12)	07:25	37 14:30 (13)	08:18
14	21:49	30 05:57 (9)	21:06	21 06:34 (10)	19:56	26 07:28 (11)	18:42	31 08:27 (12)	16:33	37 15:07 (13)	15:55
15	04:53	05:28 (7)	05:38	23 06:11 (10)	06:33	25 07:02 (11)	07:28	31 07:56 (12)	07:27	37 14:30 (13)	08:19
16	21:48	29 05:57 (9)	21:04	23 06:34 (10)	19:54	25 07:27 (11)	18:39	31 08:27 (12)	16:31	37 15:07 (13)	15:55
17	04:54	05:29 (7)	05:40	22 06:12 (10)	06:35	29 07:04 (11)	07:29	38 07:58 (12)	07:29	38 14:29 (13)	08:21
18	21:48	27 05:56 (9)	21:02	22 06:34 (10)	19:51	29 07:27 (11)	18:37	38 08:27 (12)	16:30	38 15:07 (13)	15:54
19	04:55	05:30 (7)	05:42	21 06:14 (10)	06:37	29 07:06 (11)	07:31	38 08:00 (12)	07:31	38 14:29 (13)	08:22
20	21:47	26 05:56 (9)	21:00	21 06:35 (10)	19:49	21 07:27 (11)	18:34	26 08:26 (12)	16:28	39 15:08 (13)	15:54
21	04:56	05:31 (7)	05:43	19 06:15 (10)	06:39	21 07:08 (11)	07:33	26 08:02 (12)	07:33	39 14:30 (13)	08:23
22	21:46	25 05:56 (9)	20:58	19 06:34 (10)	19:46	23 07:27 (11)	18:32	23 08:25 (12)	16:26	39 15:09 (13)	15:54
23	04:57	05:32 (7)	05:45	17 06:17 (10)	06:41	23 07:09 (11)	07:35	23 08:04 (12)	07:35	39 14:30 (13)	08:24
24	21:45	24 05:56 (9)	20:56	17 06:34 (10)	19:44	20 07:25 (11)	18:30	20 08:24 (12)	16:24	39 15:09 (13)	15:53
25	04:58	05:33 (7)	05:47	16 06:19 (10)	06:42	20 07:11 (11)	07:37	20 08:06 (12)	07:37	39 14:30 (13)	08:25
26	21:44	22 05:55 (9)	20:54	15 06:34 (10)	19:41	17 07:25 (11)	18:27	17 08:23 (12)	16:23	39 15:09 (13)	15:53
27	04:59	05:34 (9)	05:49	14 06:20 (10)	06:44	17 07:13 (11)	07:39	17 08:08 (12)	07:39	39 14:30 (13)	08:26
28	21:43	21 05:55 (9)	20:52	13 06:33 (10)	19:39	14 07:24 (11)	18:25	14 08:22 (12)	16:21	38 15:08 (13)	15:53
29	05:01	05:36 (9)	05:51	11 06:22 (10)	06:46	11 07:15 (11)	07:41	10 08:10 (12)	07:41	38 14:31 (13)	08:27
30	21:42	19 05:55 (9)	20:50	11 06:33 (10)	19:36	10 07:23 (11)	18:23	10 08:20 (12)	16:19	37 15:08 (13)	15:53
31	05:02	05:37 (9)	05:52	8 06:23 (10)	06:48	8 07:16 (11)	07:42	6 08:12 (12)	07:43	37 14:31 (13)	08:28
1	21:41	17 05:54 (9)	20:47	8 06:31 (10)	19:34	4 07:20 (11)	18:20	6 08:18 (12)	16:18	37 15:08 (13)	15:53
2	05:03	05:38 (9)	05:54	6 06:25 (10)	06:50		07:44	1 08:14 (12)	07:44	37 14:31 (13)	08:29
3	21:40	15 05:53 (9)	20:45	6 06:31 (10)	19:31		18:18	1 08:15 (12)	16:16	37 15:08 (13)	15:53
4	05:05	05:39 (9)	05:56	3 06:27 (10)	06:51		07:46		07:46	37 14:32 (13)	08:30
5	21:39	13 05:52 (9)	20:43	3 06:30 (10)	19:29		18:16		16:15	36 15:08 (13)	15:53
6	05:06	05:40 (9)	05:58		06:53		07:48		07:48	36 14:32 (13)	08:31
7	21:37	11 05:51 (9)	20:41		19:26		18:13		16:13	35 15:07 (13)	15:54
8	05:07	05:42 (9)	05:59		06:55		07:50		07:50	35 14:33 (13)	08:32
9	21:36	9 05:51 (9)	20:39		19:24		18:11		16:12	34 15:07 (13)	15:54
10	05:09	05:43 (9)	06:01		06:57		07:52		07:52	34 14:35 (13)	08:32
11	21:35	6 05:49 (9)	20:36		19:21		18:09		16:10	33 15:08 (13)	15:54
12	05:10	05:45 (9)	06:03		06:58		07:54		07:54	33 14:36 (13)	08:33
13	21:33	2 05:47 (9)	20:34		19:19		18:06		16:09	31 15:07 (13)	15:55
14	05:12		06:05		07:00		07:56		07:56	31 14:37 (13)	08:33
15	21:32		20:32		19:16		18:04		16:08	30 15:07 (13)	15:55
16	05:13		06:07		07:02		07:58		07:57	30 14:38 (13)	08:34
17	21:30		20:29		19:14		18:02		16:06	28 15:06 (13)	15:56
18	05:15		06:08		07:04		08:00		07:59	28 14:38 (13)	08:34
19	21:29		20:27		19:11		18:00		16:05	27 15:05 (13)	15:56
20	05:16		06:10		07:06		08:02		08:01	27 14:39 (13)	08:35
21	21:27		20:25		19:09		17:58		16:04	25 15:04 (13)	15:57
22	05:18		06:12		07:07		07:04		08:03	25 14:41 (13)	08:35
23	21:26		20:23		19:06		16:55		16:03	23 15:04 (13)	15:58
24	05:20		06:14		07:09		08:09 (12)		14:47 (13)	23 14:42 (13)	08:35
25	21:24		20:20		19:04	12 08:21 (12)	16:53	5 14:52 (13)	16:02	21 15:03 (13)	15:58
26	05:21		06:16		07:11	18 08:05 (12)	07:08	15 14:42 (13)	08:06	21 14:44 (13)	08:35
27	21:22		20:18		19:01	18 08:23 (12)	16:51	15 14:57 (13)	16:01	18 15:02 (13)	15:59
28	05:23		06:17		07:13	21 08:03 (12)	07:09	20 14:39 (13)	08:08	15 14:46 (13)	08:35
29	21:21		20:15		18:59	21 08:24 (12)	16:49	20 14:59 (13)	16:00	15 15:01 (13)	16:00
30	05:25		06:19				07:11	24 14:37 (13)			08:35
31	21:19		20:13				16:47	24 15:01 (13)			16:01
Sonnenscheinstunden		514		462		384		330		259	
astr.max.mögl.Beschattung		489		259		330		444		967	18

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang (WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Minuten mit Schatten
		Zeitpunkt (SS:MM) Schattenende (WEA mit letztem Schatten)

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH

Bremerhavener Heerstraße 10

DE-28717 Bremen

+49 (0) 421 79 400 600

info@th-ingenieure.de

Berechnet:

28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: G - IO 7

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar		Februar		März		April		Mai		Juni							
1	08:35	14:03 (13)	08:06	08:36 (12)	07:08		06:53		05:43	06:11 (7)	04:52	05:30 (6)						
	16:02	16	14:19 (13)	16:53	6	08:42 (12)	17:50		19:49	52	07:12 (9)	21:36	22	05:52 (6)				
2	08:35		14:03 (13)	08:04		08:35 (12)	07:06		06:50		06:09 (7)	04:51		05:30 (6)				
	16:04	16	14:19 (13)	16:55	9	08:44 (12)	17:52		19:51	2	07:18 (10)	20:47	54	07:11 (9)	21:37	22	05:52 (6)	
3	08:35		14:05 (13)	08:02		08:33 (12)	07:04		06:48		06:07 (7)	04:50		05:30 (6)				
	16:05	14	14:19 (13)	16:57	12	08:45 (12)	17:54		19:53	6	07:20 (10)	20:49	54	07:10 (9)	21:38	22	05:52 (6)	
4	08:35		14:05 (13)	08:01		08:31 (12)	07:01	07:28 (11)	06:46		07:11 (10)	05:37		06:05 (7)	04:49		05:32 (6)	
	16:06	13	14:18 (13)	16:59	15	08:46 (12)	17:56	3	07:31 (11)	19:54	9	07:20 (10)	20:50	55	07:09 (9)	21:39	20	05:52 (6)
5	08:35		14:07 (13)	07:59		08:29 (12)	06:59		06:43		07:09 (10)	05:35		06:03 (7)	04:48		05:32 (6)	
	16:07	11	14:18 (13)	17:01	17	08:46 (12)	17:58	7	07:32 (11)	19:56	12	07:21 (10)	20:52	56	07:08 (9)	21:41	20	05:52 (6)
6	08:34		14:09 (13)	07:57		08:27 (12)	06:57		07:23 (11)	06:41		07:06 (10)	05:33		06:01 (7)	04:48		05:32 (6)
	16:08	7	14:16 (13)	17:04	20	08:47 (12)	18:00	10	07:33 (11)	19:58	15	07:21 (10)	20:54	55	07:06 (9)	21:42	19	05:51 (6)
7	08:34		14:13 (13)	07:55		08:25 (12)	06:54		07:21 (11)	06:38		07:04 (10)	05:31		05:59 (7)	04:47		05:33 (6)
	16:10	2	14:15 (13)	17:06	22	08:47 (12)	18:01	13	07:34 (11)	20:00	17	07:21 (10)	20:56	54	07:05 (9)	21:43	19	05:52 (6)
8	08:33			07:53		08:23 (12)	06:52		07:18 (11)	06:36		07:01 (10)	05:29		05:58 (7)	04:46		05:33 (6)
	16:11			17:08	25	08:48 (12)	18:03	16	07:34 (11)	20:02	19	07:20 (10)	20:58	51	07:03 (9)	21:44	18	05:51 (6)
9	08:33			07:51		08:21 (12)	06:49		07:16 (11)	06:33		06:59 (10)	05:27		05:59 (7)	04:46		05:34 (6)
	16:12			17:10	27	08:48 (12)	18:05	18	07:34 (11)	20:04	21	07:20 (10)	20:59	47	07:01 (9)	21:45	17	05:51 (6)
10	08:32			07:50		08:19 (12)	06:47		07:13 (11)	06:31		06:57 (10)	05:25		05:59 (7)	04:45		05:34 (6)
	16:14			17:12	28	08:47 (12)	18:07	21	07:34 (11)	20:06	23	07:20 (10)	21:01	40	06:58 (9)	21:46	16	05:50 (6)
11	08:32			07:48		08:19 (12)	06:45		07:11 (11)	06:29		06:54 (9)	05:23		05:58 (7)	04:45		05:35 (6)
	16:15			17:14	28	08:47 (12)	18:09	23	07:34 (11)	20:08	25	07:19 (10)	21:03	29	06:27 (7)	21:46	16	05:51 (6)
12	08:31			07:46		08:20 (12)	06:42		07:08 (11)	06:26		06:52 (9)	05:21		05:59 (7)	04:44		05:36 (6)
	16:17			17:16	27	08:47 (12)	18:11	25	07:33 (11)	20:09	26	07:18 (10)	21:05	28	06:27 (7)	21:47	15	05:51 (6)
13	08:30			07:44		08:21 (12)	06:40		07:09 (11)	06:24		06:50 (9)	05:19		05:59 (7)	04:44		05:36 (6)
	16:19			17:18	25	08:46 (12)	18:13	24	07:33 (11)	20:11	27	07:17 (10)	21:06	27	06:26 (7)	21:48	14	05:50 (6)
14	08:29			07:41		08:22 (12)	06:37		07:08 (11)	06:21		06:47 (9)	05:18		06:00 (7)	04:43		05:36 (6)
	16:20			17:20	24	08:46 (12)	18:15	23	07:31 (11)	20:13	28	07:15 (10)	21:08	25	06:25 (7)	21:49	14	05:50 (6)
15	08:28			07:39		08:23 (12)	06:35		07:10 (11)	06:19		06:45 (9)	05:16		05:46 (6)	04:43		05:37 (6)
	16:22			17:22	22	08:45 (12)	18:17	20	07:30 (11)	20:15	28	07:13 (10)	21:10	25	06:25 (7)	21:49	13	05:50 (6)
16	08:27			07:37		08:23 (12)	06:32		07:10 (11)	06:17		06:43 (9)	05:14		05:44 (6)	04:43		05:38 (6)
	16:24			17:24	20	08:43 (12)	18:19	18	07:28 (11)	20:17	31	07:14 (9)	21:12	27	06:24 (7)	21:50	12	05:50 (6)
17	08:26			07:35		08:25 (12)	06:30		07:12 (11)	06:14		06:40 (9)	05:12		05:43 (6)	04:43		05:38 (6)
	16:25			17:26	17	08:42 (12)	18:21	14	07:26 (11)	20:19	34	07:14 (9)	21:13	28	06:24 (7)	21:50	12	05:50 (6)
18	08:25			07:33		08:27 (12)	06:27		07:15 (11)	06:12		06:38 (9)	05:11		05:41 (6)	04:43		05:39 (6)
	16:27			17:28	13	08:40 (12)	18:23	7	07:22 (11)	20:21	36	07:14 (9)	21:15	27	06:22 (7)	21:51	11	05:50 (6)
19	08:24			07:31		08:33 (12)	06:25		06:10			06:36 (9)	05:09		05:40 (6)	04:43		05:39 (6)
	16:29			17:30	2	08:35 (12)	18:24		20:23	39	07:15 (9)	21:17	28	06:22 (7)	21:51	11	05:50 (6)	
20	08:23			07:29			06:23		06:07			06:36 (9)	05:08		05:38 (6)	04:43		05:39 (6)
	16:31			17:32			18:26		20:24	40	07:16 (9)	21:18	27	06:20 (7)	21:52	11	05:50 (6)	
21	08:22			07:27			06:20		06:05			06:35 (9)	05:06		05:37 (6)	04:43		05:39 (6)
	16:32			17:34			18:28		20:26	41	07:16 (9)	21:20	25	06:18 (7)	21:52	11	05:50 (6)	
22	08:21			07:24			06:18		06:03			06:34 (9)	05:05		05:36 (6)	04:43		05:39 (6)
	16:34			17:36			18:30		20:28	41	07:15 (9)	21:21	20	06:15 (7)	21:52	11	05:50 (6)	
23	08:19			07:22			06:15		06:00			06:34 (9)	05:03		05:34 (6)	04:43		05:40 (6)
	16:36			17:38			18:32		20:30	41	07:15 (9)	21:23	17	05:51 (6)	21:53	11	05:51 (6)	
24	08:18			07:20			06:13		05:58			06:34 (9)	05:02		05:33 (6)	04:43		05:40 (6)
	16:38			17:40			18:34		20:32	41	07:15 (9)	21:25	19	05:52 (6)	21:53	11	05:51 (6)	
25	08:17			07:18			06:10		05:56			06:34 (9)	05:00		05:32 (6)	04:44		05:40 (6)
	16:40			17:42			18:36		20:34	41	07:15 (9)	21:26	20	05:52 (6)	21:53	11	05:51 (6)	
26	08:15			07:15			06:08		05:54			06:34 (9)	04:59		05:31 (6)	04:44		05:41 (6)
	16:42			17:44			18:38		20:36	41	07:15 (9)	21:28	21	05:52 (6)	21:53	11	05:52 (6)	
27	08:14			07:13			06:05		05:52			06:19 (7)	04:58		05:30 (6)	04:44		05:40 (6)
	16:44			17:46			18:40		20:37	42	07:14 (9)	21:29	23	05:53 (6)	21:53	12	05:52 (6)	
28	08:12			07:11			06:03		05:49			06:17 (7)	04:56		05:29 (6)	04:45		05:41 (6)
	16:46			17:48			18:41		20:39	46	07:14 (9)	21:30	24	05:53 (6)	21:53	12	05:53 (6)	
29	08:11						06:00		05:47			06:15 (7)	04:55		05:29 (6)	04:45		05:40 (6)
	16:48						18:43		20:41	49	07:14 (9)	21:32	24	05:53 (6)	21:52	13	05:53 (6)	
30	08:09						05:58		05:45			06:13 (7)	04:54		05:29 (6)	04:46		05:40 (6)
	16:49						18:45		20:43	51	07:13 (9)	21:33	24	05:53 (6)	21:52	14	05:54 (6)	
31	08:08		08:38 (12)				06:55					04:53			05:30 (6)			
	16:51	3	08:41 (12)				19:47					21:35	22		05:52 (6)			
Sonnenscheinstunden	248		271				365		419			494			511			
astr.max.mögl.Beschattung	82		359				242		872			1028			441			

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)		Zeitpunkt (SS:MM) Schattenende	(WEA mit letztem Schatten)

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH

Bremerhavener Heerstraße 10

DE-28717 Bremen

+49 (0) 421 79 400 600

info@th-ingenieure.de

Berechnet:

28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: G - IO 7

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

Juli		August		September		Oktober		November		Dezember	
1	04:47	05:39 (6)	05:26	06:10 (7)	06:21	06:50 (9)	07:15	07:48 (11)	07:13	07:49 (12)	08:09
2	21:52	05:54 (6)	21:17	06:36 (7)	20:11	07:17 (10)	18:56	08:11 (11)	16:45	08:16 (12)	15:59
3	04:47	05:40 (6)	05:28	06:10 (7)	06:23	06:52 (9)	07:17	07:47 (11)	07:15	07:49 (12)	08:11
4	21:52	05:55 (6)	21:16	06:37 (7)	20:08	07:17 (10)	18:54	08:11 (11)	16:43	08:17 (12)	15:58
5	04:48	05:40 (6)	05:30	06:09 (7)	06:25	06:54 (9)	07:18	07:47 (11)	07:17	07:49 (12)	08:12
6	21:51	05:56 (6)	21:14	06:37 (7)	20:06	07:18 (10)	18:51	08:12 (11)	16:41	08:17 (12)	15:58
7	04:49	05:40 (6)	05:31	06:09 (7)	06:26	06:56 (10)	07:20	07:49 (11)	07:19	07:52 (12)	08:14
8	21:51	05:56 (6)	21:12	07:08 (9)	20:03	07:18 (10)	18:49	08:12 (11)	16:39	08:17 (12)	15:57
9	04:50	05:39 (6)	05:33	06:08 (7)	06:28	06:57 (10)	07:22	07:51 (11)	07:21	07:54 (12)	08:15
10	21:50	05:56 (6)	21:10	07:10 (9)	20:01	07:17 (10)	18:47	08:12 (11)	16:37	08:17 (12)	15:56
11	04:51	05:39 (6)	05:35	06:08 (7)	06:30	06:59 (10)	07:24	07:52 (11)	07:23	07:56 (12)	08:17
12	21:50	05:57 (6)	21:08	07:13 (9)	19:59	07:17 (10)	18:44	08:10 (11)	16:35	08:17 (12)	15:56
13	04:52	05:39 (6)	05:36	06:09 (7)	06:32	07:01 (10)	07:26	07:54 (11)	07:25	07:58 (12)	08:18
14	21:49	05:58 (6)	21:06	07:15 (9)	19:56	07:17 (10)	18:42	08:10 (11)	16:33	08:16 (12)	15:55
15	04:53	05:39 (6)	05:38	06:10 (7)	06:33	07:02 (10)	07:28	07:56 (11)	07:27	08:00 (12)	08:19
16	21:48	05:58 (6)	21:04	07:15 (9)	19:54	07:15 (10)	18:39	08:09 (11)	16:31	08:16 (12)	15:55
17	04:54	05:39 (6)	05:40	06:12 (7)	06:35	07:04 (10)	07:29	07:58 (11)	07:29	08:02 (12)	08:21
18	21:48	05:59 (6)	21:02	07:17 (9)	19:51	07:15 (10)	18:37	08:08 (11)	16:29	08:15 (12)	15:54
19	04:55	05:38 (6)	05:42	06:14 (7)	06:37	07:06 (10)	07:31	08:00 (11)	07:31	08:04 (12)	08:22
20	21:47	05:59 (6)	21:00	07:18 (9)	19:49	07:14 (10)	18:34	08:07 (11)	16:28	08:14 (12)	15:54
21	04:56	05:38 (6)	05:43	06:15 (7)	06:39	07:08 (10)	07:33	08:02 (11)	07:33	08:07 (12)	08:23
22	21:46	06:00 (6)	20:58	07:18 (9)	19:46	07:12 (10)	18:32	08:05 (11)	16:26	08:14 (12)	15:54
23	04:57	05:38 (6)	05:45	06:17 (7)	06:41		07:35		07:35	08:09 (12)	08:24
24	21:45	06:00 (6)	20:56	07:19 (9)	19:44		18:30		16:24	08:13 (12)	15:53
25	04:58	05:38 (6)	05:47	06:19 (7)	06:42		07:37		07:37	08:11 (12)	08:25
26	21:44	06:00 (6)	20:54	07:20 (9)	19:41		18:27		16:23	08:12 (12)	15:53
27	04:59	05:38 (6)	05:49	06:20 (7)	06:44		07:39		07:39		08:26
28	21:43	06:00 (6)	20:52	07:20 (9)	19:39		18:25		16:21		15:53
29	05:01	05:37 (6)	05:51	06:22 (7)	06:46		18:23		16:19		15:53
30	21:42	06:01 (6)	20:50	07:21 (9)	19:36		18:23		16:19		15:53
31	05:02	05:38 (6)	05:52	06:23 (7)	06:48		18:20		16:18		15:53
1	21:41	06:02 (6)	20:47	07:20 (9)	19:34		18:18		16:16		15:53
2	05:03	05:38 (6)	05:54	06:25 (7)	06:50		18:18		16:16		15:53
3	21:40	06:02 (6)	20:45	07:21 (9)	19:31		18:18		16:16		15:53
4	05:05	05:39 (6)	05:56	06:40 (9)	06:51		18:16		16:15		15:53
5	21:39	06:01 (6)	20:43	07:21 (9)	19:29		18:16		16:15		15:53
6	05:06	05:40 (6)	05:58	06:39 (9)	06:53		18:13		16:13		15:54
7	21:37	06:01 (6)	20:41	07:21 (9)	19:26		18:13		16:13		15:54
8	05:07	05:42 (6)	05:59	06:39 (9)	06:55		18:11		16:12		15:54
9	21:36	06:02 (6)	20:39	07:21 (9)	19:24		18:11		16:12		15:54
10	05:09	05:43 (6)	06:01	06:39 (9)	06:57		18:09		16:10		15:54
11	21:35	06:02 (6)	20:36	07:21 (9)	19:21		18:09		16:10		15:54
12	05:10	05:44 (6)	06:03	06:39 (9)	06:58		18:07		16:08		15:55
13	21:33	06:01 (6)	20:34	07:21 (9)	19:19		18:06		16:09		15:55
14	05:12	05:46 (6)	06:05	06:39 (9)	07:00		18:06		16:09		15:55
15	21:32	06:25 (7)	20:32	07:20 (9)	19:16		18:04		16:08		15:55
16	05:13	05:47 (6)	06:07	06:39 (9)	07:02		18:04		16:08		15:55
17	21:30	06:28 (7)	20:29	07:19 (9)	19:14		18:02		16:06		15:56
18	05:15	05:49 (6)	06:08	06:40 (9)	07:04		18:00		16:06		15:56
19	21:29	06:31 (7)	20:27	07:19 (9)	19:11		18:00		16:06		15:56
20	05:16	05:50 (6)	06:10	06:40 (9)	07:06		18:02		16:08		15:56
21	21:27	06:32 (7)	20:25	07:17 (9)	19:09		17:58		16:04		15:57
22	05:18	05:52 (6)	06:12	06:42 (9)	07:07		17:57		16:04		15:57
23	21:26	06:33 (7)	20:23	07:17 (9)	19:06		17:57		16:04		15:57
24	05:20	05:53 (6)	06:14	06:44 (9)	07:09		17:54		16:03		15:58
25	21:24	06:34 (7)	20:20	07:16 (9)	19:04		17:54		16:03		15:58
26	05:21	05:55 (6)	06:16	06:45 (9)	07:11		17:51		16:01		15:59
27	21:22	06:35 (7)	20:18	07:14 (9)	19:01		17:51		16:01		15:59
28	05:23	05:56 (6)	06:17	06:47 (9)	07:13		17:49		16:00		15:59
29	21:21	06:35 (7)	20:15	07:15 (10)	18:59		17:47		16:00		15:59
30	05:25	06:11 (7)	06:19	06:49 (9)			17:41		16:00		15:59
31	21:19	06:36 (7)	20:13	07:17 (10)			16:47		16:01		15:59
Sonnenscheinstunden		514	462	384	330	327	259	221	232	430	
astr. max. mögl. Beschattung		667	1307	249	327	221	430				

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende	(WEA mit letztem Schatten)

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen
im Rahmen des Repowering-Vorhabens im Windpark Kesdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: H - IO 8

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 16:02	08:06 16:53	08:36 (12) 17:08	06:53 19:49	07:18 (10) 20:45	06:11 (7) 21:36
2	08:35 16:04	08:04 16:55	08:35 (12) 17:06	06:50 19:51	07:16 (10) 20:47	06:09 (7) 21:37
3	08:35 16:05	08:02 16:57	08:33 (12) 17:04	06:48 19:53	07:14 (10) 20:49	06:08 (7) 21:38
4	08:35 16:06	08:01 16:59	08:31 (12) 17:01	06:46 19:54	07:11 (10) 20:50	06:07 (7) 21:39
5	08:35 16:07	07:59 17:01	08:29 (12) 17:01	06:43 19:56	07:09 (10) 20:52	06:06 (7) 21:41
6	08:34 16:08	07:57 17:04	08:27 (12) 17:00	06:41 19:58	07:06 (10) 20:53	06:05 (7) 21:42
7	08:34 16:10	07:55 17:06	08:25 (12) 16:59	06:38 20:00	07:04 (10) 20:56	06:04 (7) 21:43
8	08:33 16:11	07:53 17:08	08:23 (12) 18:03	06:36 20:02	07:01 (9) 20:59	06:03 (7) 21:44
9	08:33 16:12	07:51 17:10	08:21 (12) 18:05	06:33 20:04	06:59 (9) 20:57	06:01 (7) 21:45
10	08:32 16:14	07:50 17:12	08:20 (12) 18:07	06:31 20:06	06:57 (9) 20:59	06:00 (7) 21:46
11	08:32 16:15	07:48 17:14	08:18 (12) 18:09	06:29 20:08	06:54 (9) 21:01	05:58 (6) 21:47
12	08:31 16:17	07:46 17:16	08:16 (12) 18:11	06:26 20:09	06:52 (9) 21:03	05:56 (6) 21:48
13	08:30 16:19	07:44 17:18	08:14 (12) 18:13	06:24 20:11	06:50 (9) 21:05	05:54 (6) 21:49
14	08:29 16:20	07:41 17:20	08:12 (12) 18:15	06:21 20:13	06:48 (9) 21:07	05:52 (6) 21:50
15	08:28 16:22	07:39 17:22	08:10 (12) 18:17	06:19 20:15	06:46 (9) 21:09	05:50 (6) 21:51
16	08:27 16:24	07:37 17:24	08:08 (12) 18:19	06:17 20:17	06:44 (9) 21:11	05:48 (6) 21:52
17	08:26 16:25	07:35 17:26	08:06 (12) 18:21	06:15 20:19	06:42 (9) 21:13	05:46 (6) 21:53
18	08:25 16:27	07:33 17:28	08:04 (12) 18:23	06:13 20:21	06:40 (9) 21:15	05:44 (6) 21:54
19	08:24 16:29	07:31 17:30	08:02 (12) 18:24	06:11 20:23	06:38 (9) 21:17	05:42 (6) 21:55
20	08:23 16:31	07:29 17:32	08:00 (12) 18:26	06:09 20:24	06:36 (9) 21:18	05:40 (6) 21:56
21	08:22 16:32	07:27 17:34	07:58 (12) 18:28	06:07 20:26	06:34 (9) 21:20	05:38 (6) 21:57
22	08:21 16:34	07:24 17:36	07:56 (12) 18:30	06:05 20:28	06:32 (9) 21:22	05:36 (6) 21:58
23	08:19 16:36	07:22 17:38	07:54 (12) 18:32	06:03 20:30	06:30 (9) 21:24	05:34 (6) 21:59
24	08:18 16:38	07:20 17:40	07:52 (12) 18:34	06:01 20:32	06:28 (9) 21:26	05:32 (6) 22:00
25	08:17 16:40	07:18 17:42	07:50 (12) 18:36	05:59 20:34	06:26 (9) 21:28	05:30 (6) 22:01
26	08:15 16:42	07:15 17:44	07:48 (12) 18:38	05:57 20:36	06:24 (9) 21:30	05:28 (6) 22:02
27	08:14 16:44	07:13 17:46	07:46 (12) 18:40	05:55 20:37	06:22 (9) 21:32	05:26 (6) 22:03
28	08:12 16:46	07:11 17:48	07:44 (12) 18:42	05:53 20:39	06:20 (9) 21:34	05:24 (6) 22:04
29	08:11 16:48	07:09 17:50	07:42 (12) 18:44	05:51 20:41	06:18 (9) 21:36	05:22 (6) 22:05
30	08:09 16:49	07:07 17:52	07:40 (12) 18:46	05:49 20:43	06:16 (9) 21:38	05:20 (6) 22:06
31	08:08 16:51	07:06 17:54	07:39 (12) 18:48	05:47 20:45	06:14 (9) 21:40	05:18 (6) 22:07
Sonnenscheinstunden	248	271	365	419	494	511
astr.max.mögl.Beschattung	14	321	228	1012	725	529

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende	(WEA mit letztem Schatten)

Projekt: 19-095-GBK-02	Beschreibung: Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kesdorf	Lizenzierter Anwender: T&H Ingenieure GmbH Bremerhavener Heerstraße 10 DE-28717 Bremen +49 (0) 421 79 400 600 info@th-ingenieure.de Berechnet: 28.08.2019 10:21/3.2.744
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SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: H - IO 8

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Jul	August	September	Oktober	November	Dezember
1	04:47	05:22 (5)	05:26	05:59 (6)	06:21	06:50 (9)
2	21:52	05:40 (5)	21:17	06:39 (7)	20:11	07:15
3	04:47	05:23 (5)	05:28	06:01 (6)	06:23	06:52 (9)
4	21:52	05:40 (5)	21:16	06:41 (7)	20:08	07:25 (9)
5	04:48	05:24 (5)	05:30	06:02 (6)	06:25	06:54 (9)
6	21:51	05:40 (5)	21:14	06:41 (7)	20:06	07:24 (9)
7	04:49	05:25 (5)	05:31	06:20 (7)	06:26	06:56 (9)
8	21:51	05:40 (5)	21:12	06:43 (7)	20:03	07:23 (9)
9	04:50	05:25 (5)	05:33	06:19 (7)	06:28	06:57 (9)
10	21:50	05:38 (5)	21:10	06:43 (7)	20:01	07:22 (10)
11	04:51	05:26 (5)	05:35	06:18 (7)	06:30	06:59 (9)
12	21:50	05:38 (5)	21:08	06:44 (7)	19:59	07:22 (10)
13	04:52	05:27 (5)	05:36	06:18 (7)	06:32	07:01 (10)
14	21:49	05:37 (5)	21:06	06:45 (7)	19:56	07:23 (10)
15	04:53	05:28 (5)	05:38	06:17 (7)	06:33	07:02 (10)
16	21:48	05:58 (6)	21:04	06:44 (7)	19:54	07:22 (10)
17	04:54	05:29 (5)	05:40	06:17 (7)	06:35	07:04 (10)
18	21:48	06:00 (6)	21:02	06:45 (7)	19:51	07:22 (10)
19	04:55	05:30 (5)	05:42	06:17 (7)	06:37	07:06 (10)
20	21:47	06:01 (6)	21:00	06:45 (7)	19:49	07:21 (10)
21	04:56	05:50 (6)	05:43	06:16 (7)	06:39	07:08 (10)
22	21:46	06:02 (6)	20:58	06:45 (7)	19:46	07:21 (10)
23	04:57	05:49 (6)	05:45	06:17 (7)	06:41	07:09 (10)
24	21:45	06:03 (6)	20:56	07:18 (9)	19:44	07:19 (10)
25	04:58	05:48 (6)	05:47	06:19 (7)	06:42	07:11 (10)
26	21:44	06:04 (6)	20:54	07:21 (9)	19:41	07:18 (10)
27	04:59	05:48 (6)	05:49	06:20 (7)	06:44	07:13 (10)
28	21:43	06:05 (6)	20:52	07:22 (9)	19:39	07:17 (10)
29	05:01	05:47 (6)	05:51	06:22 (7)	06:46	07:41
30	21:42	06:05 (6)	20:50	07:24 (9)	19:36	07:43
31	05:02	05:48 (6)	05:52	06:23 (7)	06:48	07:43
32	21:41	06:07 (6)	20:47	07:25 (9)	19:34	07:44
33	05:03	05:47 (6)	05:54	06:25 (7)	06:50	07:44
34	21:40	06:07 (6)	20:45	07:26 (9)	19:31	07:46
35	05:05	05:46 (6)	05:56	06:27 (7)	06:51	07:46
36	21:39	06:07 (6)	20:43	07:28 (9)	19:29	07:46
37	05:06	05:46 (6)	05:58	06:28 (7)	06:53	07:48
38	21:37	06:07 (6)	20:41	07:28 (9)	19:26	07:48
39	05:07	05:46 (6)	05:59	06:30 (7)	06:55	07:50
40	21:36	06:08 (6)	20:39	07:28 (9)	19:24	07:52
41	05:09	05:46 (6)	06:01	06:32 (7)	06:57	07:52
42	21:35	06:08 (6)	20:36	07:29 (9)	19:21	07:54
43	05:10	05:45 (6)	06:03	06:52 (9)	06:58	07:54
44	21:33	06:08 (6)	20:34	07:30 (9)	19:19	07:56
45	05:12	05:46 (6)	06:05	06:50 (9)	07:00	07:56
46	21:32	06:09 (6)	20:32	07:29 (9)	19:16	07:58
47	05:13	05:47 (6)	06:07	06:50 (9)	07:02	07:58
48	21:30	06:09 (6)	20:30	07:30 (9)	19:14	08:00
49	05:15	05:49 (6)	06:08	06:50 (9)	07:04	08:00
50	21:29	06:10 (6)	20:27	07:30 (9)	19:11	08:02
51	05:16	05:50 (6)	06:10	06:49 (9)	07:06	08:02
52	21:27	06:09 (6)	20:25	07:29 (9)	19:09	08:03
53	05:18	05:52 (6)	06:12	06:49 (9)	07:07	08:03
54	21:26	06:09 (6)	20:23	07:29 (9)	19:06	08:03
55	05:20	05:53 (6)	06:14	06:49 (9)	07:09	08:04
56	21:24	06:09 (6)	20:20	07:29 (9)	19:04	08:04
57	05:21	05:55 (6)	06:16	06:48 (9)	07:11	08:06
58	21:22	06:09 (6)	20:18	07:28 (9)	19:01	08:06
59	05:23	05:56 (6)	06:17	06:48 (9)	07:13	08:08
60	21:21	06:34 (7)	20:15	07:27 (9)	18:59	08:17 (12)
61	05:25	05:58 (6)	06:19	06:49 (9)	07:11	08:17 (12)
62	21:19	06:38 (7)	20:13	07:27 (9)	18:57	08:17 (12)
Sonnenscheinstunden	514	462	384	330	259	232
astr. max. mögl. Beschattung	538	1126	293	298	254	4

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende	(WEA mit letztem Schatten)
	Minuten mit Schatten		

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: I - IO 9

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2019
Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:
Die Sonne scheint täglich von Sonnenauf- bis -untergang
Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar		Februar		März		April		Mai		Juni	
1	08:35		08:06	08:36 (12)	07:08	07:35 (11)	06:53	07:18 (10)	05:43	06:19 (7)	04:52	05:25 (5)
	16:02		16:53	25 09:01 (12)	17:50	17 07:52 (11)	19:49	26 07:44 (9)	20:45	29 06:48 (7)	21:36	24 05:49 (5)
2	08:35		08:04	08:36 (12)	07:06	07:33 (11)	06:50	07:16 (10)	05:41	06:20 (7)	04:51	05:24 (5)
	16:04		16:55	26 09:02 (12)	17:52	19 07:52 (11)	19:51	30 07:46 (9)	20:47	27 06:47 (7)	21:37	25 05:49 (5)
3	08:35		08:02	08:36 (12)	07:04	07:30 (11)	06:48	07:14 (9)	05:39	06:20 (7)	04:50	05:23 (5)
	16:05		16:57	26 09:02 (12)	17:54	22 07:52 (11)	19:53	33 07:47 (9)	20:49	26 06:46 (7)	21:38	27 05:50 (5)
4	08:35		08:01	08:36 (12)	07:01	07:28 (11)	06:46	07:11 (9)	05:37	06:21 (7)	04:49	05:23 (5)
	16:06		16:59	26 09:02 (12)	17:56	24 07:52 (11)	19:54	36 07:47 (9)	20:50	24 06:45 (7)	21:39	28 05:51 (5)
5	08:35		07:59	08:37 (12)	06:59	07:27 (11)	06:43	07:09 (9)	05:35	06:21 (7)	04:48	05:22 (5)
	16:07		17:01	25 09:02 (12)	17:58	23 07:50 (11)	19:56	39 07:48 (9)	20:52	23 06:44 (7)	21:41	30 05:52 (5)
6	08:34		07:57	08:38 (12)	06:57	07:27 (11)	06:41	07:07 (9)	05:33	06:01 (6)	04:48	05:21 (5)
	16:08		17:04	23 09:01 (12)	18:00	23 07:50 (11)	19:58	40 07:47 (9)	20:54	22 06:43 (7)	21:42	31 05:52 (5)
7	08:34		07:55	08:39 (12)	06:54	07:29 (11)	06:38	07:07 (9)	05:31	05:59 (6)	04:47	05:21 (5)
	16:10		17:06	21 09:00 (12)	18:01	20 07:49 (11)	20:00	41 07:48 (9)	20:56	22 06:41 (7)	21:43	32 05:53 (5)
8	08:33		07:53	08:40 (12)	06:52	07:29 (11)	06:36	07:06 (9)	05:29	05:57 (6)	04:46	05:20 (5)
	16:11		17:08	19 08:59 (12)	18:03	18 07:47 (11)	20:02	41 07:47 (9)	20:58	21 06:39 (7)	21:44	33 05:53 (5)
9	08:33		07:51	08:41 (12)	06:49	07:31 (11)	06:33	07:06 (9)	05:27	05:56 (6)	04:46	05:20 (5)
	16:12		17:10	17 08:58 (12)	18:05	15 07:46 (11)	20:04	41 07:47 (9)	20:59	17 06:37 (7)	21:45	34 05:54 (5)
10	08:32		07:50	08:42 (12)	06:47	07:33 (11)	06:31	07:06 (9)	05:25	05:54 (6)	04:45	05:19 (5)
	16:14		17:12	13 08:55 (12)	18:07	9 07:42 (11)	20:06	41 07:47 (9)	21:01	12 06:06 (6)	21:46	35 05:54 (5)
11	08:32		07:48	08:46 (12)	06:45		06:29	07:05 (9)	05:23	05:52 (6)	04:45	05:19 (5)
	16:15		17:14	6 08:52 (12)	18:09		20:08	41 07:46 (9)	21:03	14 06:06 (6)	21:46	36 05:55 (5)
12	08:31		07:46		06:42		06:26	07:05 (9)	05:21	05:51 (6)	04:44	05:19 (5)
	16:17		17:16		18:11		20:09	41 07:46 (9)	21:05	16 06:07 (6)	21:47	37 05:56 (5)
13	08:30		07:44		06:40		06:24	07:05 (9)	05:19	05:49 (6)	04:44	05:18 (5)
	16:19		17:18		18:13		20:11	41 07:46 (9)	21:06	18 06:07 (6)	21:48	37 05:55 (5)
14	08:29		07:41		06:37		06:21	07:05 (9)	05:18	05:47 (6)	04:43	05:18 (5)
	16:20		17:20		18:15		20:13	40 07:45 (9)	21:08	20 06:07 (6)	21:49	38 05:56 (5)
15	08:28		07:39		06:35		06:19	07:05 (9)	05:16	05:46 (6)	04:43	05:18 (5)
	16:22		17:22		18:17		20:15	39 07:44 (9)	21:10	22 06:08 (6)	21:49	38 05:56 (5)
16	08:27		07:37		06:32		06:17	07:06 (9)	05:14	05:44 (6)	04:43	05:19 (5)
	16:24		17:24		18:19		20:17	38 07:44 (9)	21:12	23 06:07 (6)	21:50	38 05:57 (5)
17	08:26		07:35		06:30		06:14	07:06 (9)	05:12	05:43 (6)	04:43	05:19 (5)
	16:25		17:26		18:21		20:19	36 07:42 (9)	21:13	25 06:08 (6)	21:50	38 05:57 (5)
18	08:25		07:33		06:27		06:12	06:38 (7)	05:11	05:43 (6)	04:43	05:19 (5)
	16:27		17:28		18:23		20:21	40 07:41 (9)	21:15	24 06:07 (6)	21:51	38 05:57 (5)
19	08:24		07:31		06:25		06:10	06:36 (7)	05:09	05:43 (6)	04:43	05:19 (5)
	16:29		17:30		18:24		20:23	42 07:40 (9)	21:17	24 06:07 (6)	21:51	39 05:58 (5)
20	08:23		07:29		06:23		06:07	06:34 (7)	05:08	05:43 (6)	04:43	05:19 (5)
	16:31		17:32		18:26		20:24	43 07:39 (9)	21:18	23 06:06 (6)	21:52	39 05:58 (5)
21	08:22		07:27		06:20		06:05	06:32 (7)	05:06	05:44 (6)	04:43	05:19 (5)
	16:32		17:34		18:28		20:26	43 07:37 (9)	21:20	22 06:06 (6)	21:52	39 05:58 (5)
22	08:21		07:24		06:18		06:03	06:29 (7)	05:05	05:45 (6)	04:43	05:19 (5)
	16:34	2 08:53 (12)	17:36		18:30		20:28	42 07:34 (9)	21:21	21 06:06 (6)	21:52	39 05:58 (5)
23	08:19		07:22		06:15		06:00	06:27 (7)	05:03	05:45 (6)	04:43	05:20 (5)
	16:36	4 08:56 (12)	17:38		18:32		20:30	40 07:32 (9)	21:23	20 06:05 (6)	21:53	39 05:59 (5)
24	08:18		07:20		06:13		05:58	06:25 (7)	05:02	05:45 (6)	04:43	05:20 (5)
	16:38	7 08:57 (12)	17:40	1 07:48 (11)	18:34		20:32	36 07:28 (9)	21:25	20 06:05 (6)	21:53	39 05:59 (5)
25	08:17		07:18		06:10		05:56	06:23 (7)	05:00	05:46 (6)	04:44	05:20 (5)
	16:40	10 08:59 (12)	17:42	5 07:50 (11)	18:36		20:34	26 06:49 (7)	21:26	18 06:04 (6)	21:53	39 05:59 (5)
26	08:15		07:15		06:08	5 06:33 (10)	05:54	06:21 (7)	04:59	05:31 (5)	04:44	05:21 (5)
	16:42	12 08:59 (12)	17:44	8 07:50 (11)	18:38	5 06:38 (10)	20:36	28 06:49 (7)	21:28	26 06:04 (6)	21:53	38 05:59 (5)
27	08:14		07:13		06:05	06:31 (10)	05:51	06:19 (7)	04:58	05:30 (5)	04:44	05:21 (5)
	16:44	15 09:00 (12)	17:46	11 07:51 (11)	18:40	8 06:39 (10)	20:37	30 06:49 (7)	21:29	26 06:03 (6)	21:53	38 05:59 (5)
28	08:12		07:11		06:03	06:28 (10)	05:49	06:19 (7)	04:56	05:29 (5)	04:45	05:22 (5)
	16:46	17 09:01 (12)	17:48	14 07:52 (11)	18:41	11 06:39 (10)	20:39	30 06:49 (7)	21:30	27 06:02 (6)	21:53	38 06:00 (5)
29	08:11		07:09		06:00	06:26 (10)	05:47	06:19 (7)	04:55	05:28 (5)	04:45	05:21 (5)
	16:48	19 09:01 (12)			18:43	14 06:40 (10)	20:41	30 06:49 (7)	21:32	28 06:01 (6)	21:52	38 05:59 (5)
30	08:09		07:07		05:58	06:23 (10)	05:45	06:19 (7)	04:54	05:27 (5)	04:46	05:22 (5)
	16:49	21 09:01 (12)			18:45	18 06:41 (9)	20:43	29 06:48 (7)	21:33	24 05:58 (6)	21:52	38 06:00 (5)
31	08:08		07:05		06:55	07:21 (10)	20:40		04:53		05:26 (5)	
	16:51	23 09:01 (12)			19:47	23 07:44 (9)			21:35	22 05:48 (5)		
Sonnenscheinstunden	248		271		365		419		494		511	
astr. max. mögl. Beschattung	130		266		269		1103		686		1062	

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schatteneinde	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: I - IO 9

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli		August		September		Oktober		November		Dezember	
1	04:47		05:22 (5)	05:26	05:59 (6)	06:21	07:04 (9)	07:15	07:13		08:09	
	21:52	37	05:59 (5)	21:17	06:17 (6)	20:11	07:45 (9)	18:56	16:45		15:59	
2	04:47		05:23 (5)	05:28	06:01 (6)	06:23	07:04 (9)	07:17	07:15		08:13 (12)	08:11
	21:52	37	06:00 (5)	21:16	06:17 (6)	20:08	07:45 (9)	18:54	16:43	11	08:24 (12)	15:58
3	04:48		05:24 (5)	05:30	06:02 (6)	06:25	07:04 (9)	07:18	07:17		08:11 (12)	08:12
	21:51	36	06:00 (5)	21:14	06:16 (6)	20:06	07:45 (9)	18:51	16:41	15	08:26 (12)	15:58
4	04:49		05:25 (5)	05:31	06:04 (6)	06:26	07:04 (9)	07:20	07:19		08:10 (12)	08:14
	21:51	35	06:00 (5)	21:12	06:16 (6)	20:03	07:45 (9)	18:49	16:39	19	08:29 (12)	15:57
5	04:50		05:25 (5)	05:33	06:05 (6)	06:28	07:03 (9)	07:22	08:11 (11)		07:21	08:15
	21:50	34	05:59 (5)	21:10	06:46 (7)	20:01	07:44 (9)	18:47	9	08:20 (11)	16:37	21
6	04:51		05:26 (5)	05:35	06:07 (6)	06:30	07:03 (9)	07:24	08:07 (11)		07:23	08:17
	21:50	33	05:59 (5)	21:08	06:49 (7)	19:59	07:44 (9)	18:44	15	08:22 (11)	16:35	23
7	04:52		05:27 (5)	05:36	06:09 (6)	06:32	07:03 (9)	07:26	08:05 (11)		07:25	08:18
	21:49	32	05:59 (5)	21:06	06:51 (7)	19:56	07:44 (9)	18:42	18	08:23 (11)	16:33	24
8	04:53		05:28 (5)	05:38	06:10 (6)	06:33	07:03 (9)	07:28	08:04 (11)		07:27	08:19
	21:48	31	05:59 (5)	21:04	06:52 (7)	19:54	07:42 (9)	18:39	20	08:24 (11)	16:31	26
9	04:54		05:29 (5)	05:40	06:31 (7)	06:35	07:04 (9)	07:29	08:02 (11)		07:29	08:21
	21:48	30	05:59 (5)	21:02	06:53 (7)	19:51	07:41 (9)	18:37	23	08:25 (11)	16:29	26
10	04:55		05:30 (5)	05:42	06:30 (7)	06:37	07:06 (9)	07:31	08:02 (11)		07:31	08:22
	21:47	28	05:58 (5)	21:00	06:55 (7)	19:49	07:40 (9)	18:34	23	08:25 (11)	16:28	26
11	04:56		05:31 (5)	05:43	06:29 (7)	06:39	07:08 (10)	07:33	08:02 (11)		07:33	08:23
	21:46	27	05:58 (5)	20:58	06:55 (7)	19:46	07:39 (9)	18:32	24	08:26 (11)	16:26	26
12	04:57		05:32 (5)	05:45	06:28 (7)	06:41	07:09 (10)	07:35	08:04 (11)		07:35	08:24
	21:45	25	05:57 (5)	20:56	06:55 (7)	19:44	07:37 (9)	18:30	22	08:26 (11)	16:24	24
13	04:58		05:33 (5)	05:47	06:28 (7)	06:42	07:11 (10)	07:37	08:06 (11)		07:37	08:25
	21:44	24	05:57 (5)	20:54	06:56 (7)	19:41	07:36 (9)	18:27	19	08:25 (11)	16:22	22
14	04:59		05:34 (5)	05:49	06:27 (7)	06:44	07:13 (10)	07:39	08:08 (11)		07:39	08:26
	21:43	22	05:56 (5)	20:52	06:56 (7)	19:39	07:34 (9)	18:25	17	08:25 (11)	16:21	20
15	05:01		05:35 (5)	05:51	06:27 (7)	06:46	07:15 (10)	07:41	08:10 (11)		07:41	08:27
	21:42	26	06:07 (6)	20:50	06:56 (7)	19:36	07:32 (9)	18:23	15	08:25 (11)	16:19	18
16	05:02		05:37 (5)	05:52	06:26 (7)	06:48	07:16 (10)	07:43	08:12 (11)		07:43	08:28
	21:41	28	06:10 (6)	20:47	06:55 (7)	19:34	07:29 (10)	18:20	12	08:24 (11)	16:18	16
17	05:03		05:38 (5)	05:54	06:26 (7)	06:50	07:18 (10)	07:44	08:14 (11)		07:44	08:29
	21:40	27	06:11 (6)	20:45	06:56 (7)	19:31	07:28 (10)	18:18	9	08:23 (11)	16:16	13
18	05:05		05:39 (5)	05:56	06:27 (7)	06:51	07:20 (10)	07:46	08:16 (11)		07:46	08:30
	21:39	26	06:12 (6)	20:43	06:56 (7)	19:29	07:27 (10)	18:16	5	08:21 (11)	16:15	11
19	05:06		05:40 (5)	05:58	06:28 (7)	06:53	07:22 (10)	07:48	08:18 (11)		07:48	08:31
	21:37	26	06:13 (6)	20:41	06:55 (7)	19:26	07:25 (10)	18:13	2	08:20 (11)	16:13	8
20	05:07		05:56 (6)	05:59	06:30 (7)	06:55		07:50			07:50	08:32
	21:36	18	06:14 (6)	20:39	07:32 (9)	19:24		18:11			16:12	6
21	05:09		05:55 (6)	06:01	06:32 (7)	06:57		07:52			07:52	08:32
	21:35	20	06:15 (6)	20:36	07:37 (9)	19:21		18:09			16:10	3
22	05:10		05:55 (6)	06:03	06:34 (7)	06:58		07:54			07:54	08:33
	21:33	20	06:15 (6)	20:34	07:39 (9)	19:19		18:06			16:09	
23	05:12		05:55 (6)	06:05	06:35 (7)	07:00		07:56			07:56	08:33
	21:32	21	06:16 (6)	20:32	07:40 (9)	19:16		18:04			16:08	
24	05:13		05:54 (6)	06:07	06:37 (7)	07:02		07:58			07:57	08:34
	21:30	22	06:16 (6)	20:30	07:42 (9)	19:14		18:02			16:06	
25	05:15		05:54 (6)	06:08	06:39 (7)	07:04		08:00			07:59	08:34
	21:29	23	06:17 (6)	20:27	07:43 (9)	19:11		18:00			16:05	
26	05:16		05:53 (6)	06:10	06:40 (7)	07:06		08:02			08:01	08:35
	21:27	24	06:17 (6)	20:25	07:43 (9)	19:09		17:58			16:04	
27	05:18		05:54 (6)	06:12	06:42 (7)	07:07		07:04			08:03	08:35
	21:26	24	06:18 (6)	20:23	07:44 (9)	19:06		16:55			16:03	
28	05:20		05:53 (6)	06:14	07:08 (9)	07:09		07:06			08:04	08:35
	21:24	25	06:18 (6)	20:20	07:45 (9)	19:04		16:53			16:02	
29	05:21		05:55 (6)	06:16	07:06 (9)	07:11		07:08			08:06	08:35
	21:23	23	06:18 (6)	20:18	07:45 (9)	19:01		16:51			16:01	
30	05:23		05:56 (6)	06:17	07:06 (9)	07:13		07:09			08:08	08:35
	21:21	22	06:18 (6)	20:15	07:45 (9)	18:59		16:49			16:00	
31	05:25		05:58 (6)	06:19	07:05 (9)			07:11				08:35
	21:19	20	06:18 (6)	20:13	07:46 (9)			16:47				16:01
Sonneneinstrahlung	514		462		384		330		259		358	232
astr.max.mögl.Beschattung	826		917		552		233					

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenende
			(WEA mit letztem Schatten)

SHADOW - Kalender
Berechnung: Gesamtbelastung Schattenrezeptor: J - IO 10

Voraussetzungen für Berechnung des Schattenwurfs
Referenzjahr für Kalender 2019
Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:
Die Sonne scheint täglich von Sonnenauf- bis -untergang
Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

Januar		Februar		März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:36		08:06	07:08	06:53	05:43	04:52	04:47	05:26	06:21	07:15	07:13	08:09
	16:02	26	10:44 (2)	16:53	17:50	19:49	20:45	21:36	21:17	20:11	18:56	16:45	15:59
2	08:35		10:18 (2)	08:04	07:06	06:50	05:41	04:51	04:47	05:28	06:23	07:17	08:11
	16:03	25	10:43 (2)	16:55	17:52	19:51	20:47	21:37	21:52	21:16	20:08	18:54	16:43
3	08:35		10:19 (2)	08:03	07:04	06:48	05:39	04:50	04:48	05:29	06:24	07:18	08:12
	16:04	24	10:43 (2)	16:57	17:54	19:53	20:49	21:38	21:51	21:14	20:06	18:51	16:41
4	08:35		10:21 (2)	08:01	07:01	06:45	05:37	04:49	04:49	05:31	06:26	07:20	08:14
	16:06	23	10:44 (2)	16:59	17:56	19:54	20:50	21:40	21:51	21:12	20:03	18:49	16:39
5	08:35		10:21 (2)	07:59	06:59	06:43	05:35	04:48	04:50	05:33	06:28	07:22	08:15
	16:07	22	10:43 (2)	17:01	17:58	19:56	20:52	21:41	21:50	21:10	20:01	18:47	16:37
6	08:34		10:23 (2)	07:57	06:57	06:41	05:32	04:47	04:50	05:35	06:30	07:24	08:17
	16:08	20	10:43 (2)	17:03	17:59	19:58	20:54	21:42	21:50	21:08	19:59	18:44	16:35
7	08:34		10:24 (2)	07:55	06:54	06:38	05:31	04:47	04:51	05:36	06:32	07:26	08:18
	16:10	18	10:42 (2)	17:05	18:01	20:00	20:56	21:43	21:49	21:06	19:56	18:42	16:33
8	08:33		10:25 (2)	07:53	06:52	06:36	05:29	04:46	04:52	05:38	06:33	07:28	08:19
	16:11	16	10:41 (2)	17:07	18:03	20:02	20:58	21:44	21:48	21:04	19:54	18:39	16:31
9	08:33		10:27 (2)	07:52	06:49	06:33	05:27	04:45	04:53	05:40	06:35	07:29	08:21
	16:12	13	10:40 (2)	17:09	18:05	20:04	20:59	21:45	21:48	21:02	19:51	18:37	16:29
10	08:32		10:30 (2)	07:50	06:47	06:31	05:25	04:45	04:55	05:42	06:37	07:31	08:22
	16:14	9	10:39 (2)	17:12	18:07	20:06	21:01	21:46	21:47	21:00	19:49	18:34	16:28
11	08:32			07:48	06:45	06:28	05:23	04:44	04:56	05:43	06:39	07:33	08:23
	16:15			17:14	18:09	20:08	21:03	21:47	21:46	20:58	19:46	18:32	16:26
12	08:31			07:46	06:42	06:26	05:21	04:44	04:57	05:45	06:41	07:35	08:24
	16:17			17:16	18:11	20:09	21:05	21:47	21:45	20:56	19:44	18:30	16:24
13	08:30			07:44	06:40	06:24	05:19	04:44	04:58	05:47	06:42	07:37	08:25
	16:18			17:18	18:13	20:11	21:07	21:48	21:44	20:54	19:41	18:27	16:22
14	08:29			07:42	06:37	06:21	05:17	04:43	04:59	05:49	06:44	07:39	08:27
	16:20			17:20	18:15	20:13	21:08	21:49	21:43	20:52	19:39	18:25	16:21
15	08:28			07:39	06:35	06:19	05:16	04:43	05:00	05:50	06:46	07:41	08:27
	16:22			17:22	18:17	20:15	21:10	21:49	21:42	20:50	19:36	18:22	16:19
16	08:27			07:37	06:32	06:17	05:14	04:43	05:02	05:52	06:48	07:43	08:28
	16:23			17:24	18:19	20:17	21:12	21:50	21:41	20:47	19:34	18:20	16:18
17	08:26			07:35	06:30	06:14	05:12	04:43	05:03	05:54	06:49	07:44	08:29
	16:25			17:26	18:21	20:19	21:13	21:51	21:40	20:45	19:31	18:18	16:16
18	08:25			07:33	06:27	06:12	05:11	04:42	05:04	05:56	06:51	07:46	08:30
	16:27			17:28	18:23	20:21	21:15	21:51	21:39	20:43	19:29	18:15	16:14
19	08:24			07:31	06:25	06:10	05:09	04:42	05:06	05:58	06:53	07:48	08:31
	16:29			17:30	18:24	20:23	21:17	21:52	21:37	20:41	19:26	18:13	16:13
20	08:23			07:29	06:23	06:07	05:07	04:42	05:07	05:59	06:55	07:50	08:32
	16:30			17:32	18:26	20:24	21:18	21:52	21:36	20:39	19:24	18:11	16:12
21	08:22			07:27	06:20	06:05	05:06	04:43	05:09	06:01	06:57	07:52	08:32
	16:32			17:34	18:28	20:26	21:20	21:52	21:35	20:36	19:21	18:09	16:10
22	08:21			07:24	06:18	06:03	05:04	04:43	05:10	06:03	06:58	07:54	08:33
	16:34			17:36	18:30	20:28	21:22	21:52	21:33	20:34	19:19	18:06	16:09
23	08:19			07:22	06:15	06:00	05:03	04:43	05:12	06:05	07:00	07:56	08:33
	16:36			17:38	18:32	20:30	21:23	21:53	21:32	20:32	19:16	18:04	16:08
24	08:18			07:20	06:13	05:58	05:02	04:43	05:13	06:07	07:02	07:58	08:34
	16:38			17:40	18:34	20:32	21:25	21:53	21:31	20:30	19:14	18:02	16:06
25	08:17			07:18	06:10	05:56	05:00	04:43	05:15	06:08	07:04	08:00	08:34
	16:40			17:42	18:36	20:34	21:26	21:53	21:29	20:27	19:11	18:00	16:05
26	08:15			07:15	06:08	05:54	04:59	04:44	05:16	06:10	07:06	08:02	08:35
	16:42			17:44	18:38	20:36	21:28	21:53	21:27	20:25	19:09	17:58	16:04
27	08:14			07:13	06:05	05:51	04:58	04:44	05:18	06:12	07:07	08:04	08:35
	16:44			17:46	18:39	20:37	21:29	21:53	21:26	20:23	19:06	17:56	16:03
28	08:12			07:11	06:03	05:49	04:56	04:45	05:19	06:14	07:09	08:06	08:35
	16:45			17:48	18:41	20:39	21:31	21:53	21:24	20:20	19:04	17:53	16:02
29	08:11				06:00	05:47	04:55	04:45	05:21	06:16	07:11	08:08	08:35
	16:47				18:43	20:41	21:32	21:53	21:23	20:18	19:01	17:51	16:01
30	08:09				05:58	05:45	04:54	04:46	05:23	06:17	07:13	08:10	08:35
	16:49				18:45	20:43	21:33	21:52	21:21	20:15	18:59	16:49	16:00
31	08:08				06:55		04:53		05:24	06:19		07:11	08:35
	16:51				19:47		21:35		21:19	20:13		16:47	16:01
Sonnenscheinstunden		248		271	365	419	494	511	515	462	384	330	259
astr.max.mögl.Beschattung		196											716

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang (WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende (WEA mit letztem Schatten)
	Minuten mit Schatten	

Projekt:

19-095-GBK-02

Beschreibung:

Schattenwurfgutachten für die Errichtung und den Betrieb neuer Windenergieanlagen im Rahmen des Repowering-Vorhabens im Windpark Kessdorf

Lizenzierter Anwender:

T&H Ingenieure GmbH
 Bremerhavener Heerstraße 10
 DE-28717 Bremen
 +49 (0) 421 79 400 600
 info@th-ingenieure.de
 Berechnet:
 28.08.2019 10:21/3.2.744

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: K - IO 11

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung

Die Windenergieanlage/n ist/sind immer in Betrieb

Januar		Februar		März		April		Mai		Juni	
1	08:35	12:57 (6)	08:06	15:13 (4)	07:08	15:25 (4)	06:53	18:28 (2)	05:43	04:52	
	16:02	62	15:27 (5)	16:53	52	16:54 (3)	19:49	47	19:15 (2)	20:45	21:36
2	08:35	12:57 (6)	08:04	15:13 (4)	07:06	15:28 (4)	06:50		18:28 (2)	05:41	04:51
	16:03	64	15:28 (5)	16:55	53	16:06 (4)	17:52	48	19:16 (2)	20:47	21:37
3	08:35	12:58 (6)	08:02	15:13 (4)	07:04	15:31 (4)	06:48		18:26 (2)	05:39	04:50
	16:04	63	15:29 (5)	16:57	55	16:08 (4)	17:54	36	19:16 (2)	20:48	21:38
4	08:35	12:58 (6)	08:01	15:13 (4)	07:01	16:37 (3)	06:45		18:26 (2)	05:36	04:49
	16:06	64	15:30 (5)	16:59	55	16:08 (4)	17:56	10	19:17 (2)	20:50	21:39
5	08:35	12:59 (6)	07:59	15:12 (4)	06:59		06:43		18:25 (2)	05:34	04:48
	16:07	65	15:32 (5)	17:01	57	16:09 (4)	17:57		19:17 (2)	20:52	21:41
6	08:34	13:00 (6)	07:57	15:12 (4)	06:57		06:41		18:24 (2)	05:32	04:47
	16:08	65	15:33 (5)	17:03	57	16:09 (4)	17:59		19:17 (2)	20:54	21:42
7	08:34	13:01 (6)	07:55	15:12 (4)	06:54		06:38		18:24 (2)	05:30	04:47
	16:10	64	15:34 (5)	17:05	58	16:10 (4)	18:01		19:17 (2)	20:56	21:43
8	08:33	13:02 (6)	07:53	15:12 (4)	06:52		06:36		18:23 (2)	05:29	04:46
	16:11	64	15:35 (5)	17:07	58	16:10 (4)	18:03		19:16 (2)	20:58	21:44
9	08:33	13:03 (6)	07:51	15:12 (4)	06:49		06:33		18:23 (2)	05:27	04:45
	16:12	62	15:35 (5)	17:09	58	16:10 (4)	18:05		19:16 (2)	20:59	21:45
10	08:32	13:04 (6)	07:49	15:11 (4)	06:47		06:31		18:23 (2)	05:25	04:45
	16:14	61	15:35 (5)	17:11	65	16:43 (3)	18:07		19:16 (2)	21:01	21:46
11	08:32	13:06 (6)	07:47	15:11 (4)	06:45		06:28		18:22 (2)	05:23	04:44
	16:15	59	15:37 (5)	17:14	70	16:45 (3)	18:09		19:15 (2)	21:03	21:46
12	08:31	13:08 (6)	07:45	15:11 (4)	06:42		06:26		18:23 (2)	05:21	04:44
	16:17	56	15:37 (5)	17:16	75	16:48 (3)	18:11		19:15 (2)	21:05	21:47
13	08:30	13:09 (6)	07:43	15:11 (4)	06:40		06:24		18:23 (2)	05:19	04:44
	16:18	55	15:37 (5)	17:18	79	16:50 (3)	18:13		19:15 (2)	21:06	21:48
14	08:29	13:11 (6)	07:41	15:11 (4)	06:37		06:21		18:23 (2)	05:17	04:43
	16:20	52	15:38 (5)	17:20	82	16:52 (3)	18:15		19:14 (2)	21:08	21:49
15	08:28	13:13 (6)	07:39	15:12 (4)	06:35		06:19		18:23 (2)	05:16	04:43
	16:22	47	15:37 (5)	17:22	85	16:55 (3)	18:17		19:14 (2)	21:10	21:49
16	08:27	13:16 (6)	07:37	15:11 (4)	06:32		06:16		18:24 (2)	05:14	04:43
	16:23	42	15:38 (5)	17:24	87	16:56 (3)	18:19		19:13 (2)	21:12	21:50
17	08:26	15:08 (5)	07:35	15:12 (4)	06:30		06:14		18:23 (2)	05:12	04:43
	16:25	31	15:39 (4)	17:26	89	16:58 (3)	18:21	5	17:51 (1)	20:19	21:50
18	08:25	15:09 (5)	07:33	15:12 (4)	06:27		06:12		17:48 (1)	20:12	21:42
	16:27	35	15:44 (4)	17:28	89	16:59 (3)	18:22	10	17:58 (1)	20:21	21:51
19	08:24	15:09 (5)	07:31	15:13 (4)	06:25		06:09		17:46 (1)	20:09	21:42
	16:29	37	15:46 (4)	17:30	89	17:00 (3)	18:24	14	18:00 (1)	20:22	21:51
20	08:23	15:10 (5)	07:29	15:13 (4)	06:22		06:07		17:44 (1)	20:07	21:42
	16:30	39	15:49 (4)	17:32	88	16:59 (3)	18:26	17	18:01 (1)	20:24	21:52
21	08:22	15:11 (5)	07:26	15:14 (4)	06:20		06:05		17:43 (1)	20:05	21:43
	16:32	41	15:52 (4)	17:34	88	17:00 (3)	18:28	21	18:04 (1)	20:26	21:52
22	08:21	15:11 (5)	07:24	15:15 (4)	06:18		06:03		17:41 (1)	20:03	21:43
	16:34	42	15:53 (4)	17:36	86	17:00 (3)	18:30	24	18:05 (1)	20:28	21:52
23	08:19	15:13 (5)	07:22	15:15 (4)	06:15		06:00		17:41 (1)	20:08	21:43
	16:36	42	15:55 (4)	17:38	83	16:59 (3)	18:32	27	18:08 (1)	20:30	21:53
24	08:18	15:13 (5)	07:20	15:17 (4)	06:13		05:58		17:39 (1)	20:05	21:43
	16:38	43	15:56 (4)	17:40	81	16:59 (3)	18:34	30	18:09 (1)	20:32	21:53
25	08:17	15:15 (5)	07:18	15:18 (4)	06:10		05:56		17:39 (1)	20:05	21:43
	16:40	43	15:58 (4)	17:42	78	16:59 (3)	18:36	30	18:09 (1)	20:34	21:53
26	08:15	15:16 (5)	07:15	15:19 (4)	06:08		05:54		17:39 (2)	20:04	21:44
	16:42	43	15:59 (4)	17:44	74	16:58 (3)	18:38	30	18:09 (2)	20:36	21:53
27	08:14	15:16 (4)	07:13	15:21 (4)	06:05		05:51		17:37 (2)	20:05	21:44
	16:43	44	16:00 (4)	17:46	69	16:57 (3)	18:39	34	18:11 (2)	20:37	21:53
28	08:12	15:16 (4)	07:11	15:22 (4)	06:03		05:49		17:34 (2)	20:05	21:45
	16:45	46	16:02 (4)	17:48	63	16:55 (3)	18:41	38	18:12 (2)	20:39	21:53
29	08:11	15:15 (4)			06:00		05:47		17:33 (2)	20:05	21:45
	16:47	48	16:03 (4)		18:43		20:41		18:14 (2)	20:41	21:52
30	08:09	15:15 (4)			05:58		05:45		17:31 (2)	20:05	21:46
	16:49	49	16:04 (4)		18:45		20:43		18:14 (2)	20:43	21:52
31	08:08	15:14 (4)			06:55				18:30 (2)		04:53
	16:51	51	16:05 (4)		19:47		19:15 (2)		19:15 (2)		21:35
Sonnenscheinstunden		248	271	365	558	419	1219	494	511		
astr.max.mögl.Beschattung		1579	2023								

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenende
			(WEA mit letztem Schatten)

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: K - IO 11

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2019
Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:
Die Sonne scheint täglich von Sonnenauf- bis -untergang
Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung
Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober	November	Dezember
1	04:46 21:52	05:26 21:17	06:21 20:11	18:22 (2) 19:14 (2)	07:15 16:45	14:40 (4) 16:15 (3)
2	04:47 21:52	05:28 21:15	06:23 20:08	18:21 (2) 19:14 (2)	07:16 16:43	14:40 (4) 16:13 (3)
3	04:48 21:51	05:29 21:14	06:24 20:06	18:21 (2) 19:14 (2)	07:18 16:41	14:40 (4) 16:11 (3)
4	04:49 21:51	05:31 21:12	06:26 20:03	18:20 (2) 19:13 (2)	07:20 16:39	14:40 (4) 15:39 (4)
5	04:50 21:50	05:33 21:10	06:28 20:01	18:20 (2) 19:13 (2)	07:22 16:37	14:42 (4) 15:40 (4)
6	04:50 21:50	05:35 21:08	06:30 19:58	18:20 (2) 19:13 (2)	07:24 16:35	14:42 (4) 15:39 (4)
7	04:51 21:49	05:36 21:06	06:32 19:56	18:20 (2) 19:13 (2)	07:26 16:33	14:42 (4) 15:39 (4)
8	04:52 21:48	05:38 21:04	06:33 19:54	18:19 (2) 19:11 (2)	07:27 16:31	14:42 (4) 15:38 (4)
9	04:53 21:48	05:40 21:02	06:35 19:51	18:20 (2) 19:11 (2)	07:29 16:29	14:43 (4) 15:38 (4)
10	04:54 21:47	05:42 21:00	06:37 19:49	18:20 (2) 19:10 (2)	07:31 16:28	14:43 (4) 15:37 (4)
11	04:56 21:46	05:43 20:58	06:39 19:46	18:19 (2) 19:09 (2)	07:33 17:11 (3)	14:45 (4) 15:37 (4)
12	04:57 21:45	05:45 20:56	06:40 19:44	18:20 (2) 19:08 (2)	07:35 17:24 (3)	14:45 (4) 15:37 (4)
13	04:58 21:44	05:47 20:54	06:42 19:41	18:21 (2) 19:07 (2)	07:37 17:26 (3)	14:46 (4) 15:36 (4)
14	04:59 21:43	05:49 20:52	06:44 19:39	18:22 (2) 19:06 (2)	07:39 17:27 (3)	14:47 (4) 15:35 (4)
15	05:00 21:42	05:50 20:50	06:46 19:36	18:22 (2) 19:04 (2)	07:41 17:28 (3)	14:48 (4) 15:35 (4)
16	05:02 21:41	05:52 20:47	06:48 19:34	18:23 (2) 19:02 (2)	07:43 17:29 (3)	14:49 (4) 15:34 (4)
17	05:03 21:40	05:54 20:45	06:49 19:31	18:24 (2) 19:01 (2)	07:44 17:30 (3)	14:49 (5) 15:33 (4)
18	05:04 21:39	05:56 20:43	06:51 19:29	18:26 (2) 18:59 (2)	07:46 17:30 (3)	14:48 (5) 15:32 (4)
19	05:06 21:37	05:58 20:41	06:53 19:26	18:26 (1) 18:56 (1)	07:48 17:30 (3)	14:48 (5) 15:31 (4)
20	05:07 21:36	05:59 20:39	06:55 19:24	18:26 (1) 18:55 (1)	07:50 17:30 (3)	14:48 (5) 15:31 (4)
21	05:09 21:35	06:01 20:36	06:57 19:21	18:26 (1) 18:55 (1)	07:52 17:30 (3)	14:48 (5) 15:30 (4)
22	05:10 21:33	06:03 20:34	06:58 19:19	18:26 (1) 18:52 (1)	07:54 17:30 (3)	14:47 (5) 15:28 (4)
23	05:12 21:32	06:05 20:32	07:00 19:16	18:27 (1) 18:50 (1)	07:56 17:30 (3)	14:47 (5) 15:27 (4)
24	05:13 21:30	06:07 20:29	07:02 19:14	18:26 (1) 18:47 (1)	07:58 17:30 (3)	14:47 (5) 15:25 (4)
25	05:15 21:29	06:08 20:27	07:04 19:11	18:27 (1) 18:45 (1)	08:00 17:29 (3)	14:46 (5) 15:23 (4)
26	05:16 21:27	06:10 20:25	07:06 19:09	18:29 (1) 18:42 (1)	08:02 17:28 (3)	14:46 (5) 15:20 (4)
27	05:18 21:26	06:12 20:22	07:07 19:06	18:31 (1) 18:40 (1)	08:04 17:26 (3)	14:41 (4) 15:17 (5)
28	05:19 21:24	06:14 20:20	07:09 19:04	18:34 (1) 18:38 (1)	08:06 17:25 (3)	14:41 (4) 15:17 (5)
29	05:21 21:22	06:15 20:18	07:11 19:01	18:38 (1) 18:42 (1)	08:08 17:23 (3)	14:41 (4) 15:18 (5)
30	05:23 21:21	06:17 20:15	07:13 18:59	18:44 (1) 18:48 (1)	08:10 17:21 (3)	14:41 (4) 15:18 (5)
31	05:24 21:19	06:19 20:13	18:23 (2) 19:15 (2)	18:44 (1) 18:48 (1)	08:12 17:19 (3)	14:41 (4) 15:18 (5)
Sonnenscheinstunden	515	462	384	330	259	232
astr.max.mögl.Beschattung			585	1064	1529	1482
						1917

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende	(WEA mit letztem Schatten)

SHADOW - Kalender
Berechnung: Gesamtbelastung Schattenrezeptor: L - IO 12

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2019

Die dargestellten Zeiten sind die astronomisch maximal mögliche Beschattungsdauer, berechnet unter folgenden Annahmen:

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:35 16:02	08:06 16:53	07:08 17:50	16:49 (11) 06:53	19:09 (10) 05:43	19:41 (7) 04:52
2	08:35 16:03	08:04 16:55	07:06 17:52	16:49 (11) 06:50	19:06 (10) 05:41	19:41 (7) 04:51
3	08:35 16:05	08:02 16:57	07:04 17:54	16:48 (11) 06:48	19:03 (10) 05:39	19:42 (7) 04:50
4	08:35 16:06	08:01 16:59	16:27 (12) 07:01	16:48 (11) 06:45	19:01 (10) 05:36	19:42 (7) 04:49
5	08:34 16:07	07:59 17:01	16:25 (12) 06:59	16:48 (11) 06:43	19:00 (10) 05:34	19:42 (7) 04:48
6	08:34 16:08	07:57 17:03	16:33 (12) 07:57	16:48 (11) 06:56	19:30 (10) 05:32	20:08 (7) 04:47
7	08:34 16:10	07:55 17:05	16:24 (12) 07:59	16:48 (11) 06:58	18:58 (10) 05:30	19:42 (7) 04:47
8	08:33 16:11	07:53 17:07	16:23 (12) 08:01	16:48 (11) 06:38	19:31 (10) 05:29	19:43 (7) 04:46
9	08:33 16:12	07:51 17:09	16:22 (12) 08:03	16:50 (11) 06:33	18:55 (10) 05:27	19:44 (7) 04:45
10	08:32 16:14	07:49 17:11	16:21 (12) 08:05	17:14 (11) 06:31	19:32 (10) 05:25	20:04 (7) 04:45
11	08:31 16:15	07:47 17:13	16:21 (12) 08:07	16:52 (11) 06:28	18:54 (10) 05:23	19:48 (7) 04:44
12	08:31 16:17	07:45 17:16	16:45 (12) 08:09	17:12 (11) 06:26	19:31 (10) 05:21	20:02 (7) 04:44
13	08:30 16:18	07:43 17:18	16:22 (12) 08:11	16:56 (11) 06:26	18:54 (10) 05:19	19:49 (7) 04:44
14	08:29 16:20	07:41 17:20	16:22 (12) 08:13	17:08 (11) 06:24	19:32 (10) 05:19	20:07 (7) 04:44
15	08:28 16:22	07:39 17:22	16:45 (12) 08:15	20:11 06:21	18:53 (10) 05:17	21:06 04:43
16	08:27 16:23	07:37 17:24	16:22 (12) 08:17	20:13 06:19	19:31 (10) 05:16	21:08 04:43
17	08:26 16:25	07:35 17:26	16:44 (12) 08:19	20:15 06:16	18:53 (10) 05:14	21:10 04:43
18	08:25 16:27	07:33 17:28	16:23 (12) 08:21	20:17 06:14	18:53 (10) 05:12	21:12 04:43
19	08:24 16:29	07:31 17:30	16:43 (12) 08:23	20:19 06:12	19:29 (10) 05:11	21:14 04:43
20	08:23 16:30	07:29 17:32	16:26 (12) 08:25	20:21 06:10	18:54 (10) 05:09	21:16 04:42
21	08:22 16:32	07:26 17:34	16:40 (12) 08:27	20:22 06:07	19:28 (10) 05:07	21:18 04:42
22	08:21 16:34	07:24 17:36	16:22 (12) 08:29	20:24 06:05	18:55 (10) 05:06	21:20 04:43
23	08:19 16:36	07:22 17:38	16:59 (11) 08:31	20:26 06:03	19:59 (5) 05:04	21:22 04:43
24	08:18 16:38	07:20 17:40	17:07 (11) 08:33	20:28 06:00	18:56 (10) 05:03	21:24 04:43
25	08:17 16:40	07:17 17:42	17:10 (11) 08:35	20:30 05:58	20:01 (5) 05:02	21:26 04:43
26	08:15 16:42	07:15 17:44	16:54 (11) 08:37	20:32 05:56	20:03 (5) 05:01	21:28 04:43
27	08:14 16:43	07:13 17:46	17:11 (11) 08:39	20:34 05:54	19:00 (10) 05:00	21:30 04:43
28	08:12 16:45	07:11 17:48	16:50 (11) 08:41	20:36 05:52	20:05 (5) 05:00	21:32 04:43
29	08:11 16:47		17:19 (11) 08:43	20:39 05:49	19:02 (10) 04:59	21:34 04:44
30	08:09 16:49		16:49 (11) 08:45	20:41 05:47	20:07 (5) 04:58	21:36 04:44
31	08:07 16:51		17:19 (11) 08:47	20:43 05:45	20:11 (5) 04:57	21:38 04:44
Sonneneinstrahlung	248	271	365	419	494	511
astr.max.mögl.Beschattung		444	338	999	296	740

Tabellen-Layout: Die Daten für jeden Tag sind in folgender Matrix wiedergegeben (Sommerzeit wie Bezugsjahr):

Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM) Schattenende	(WEA mit letztem Schatten)